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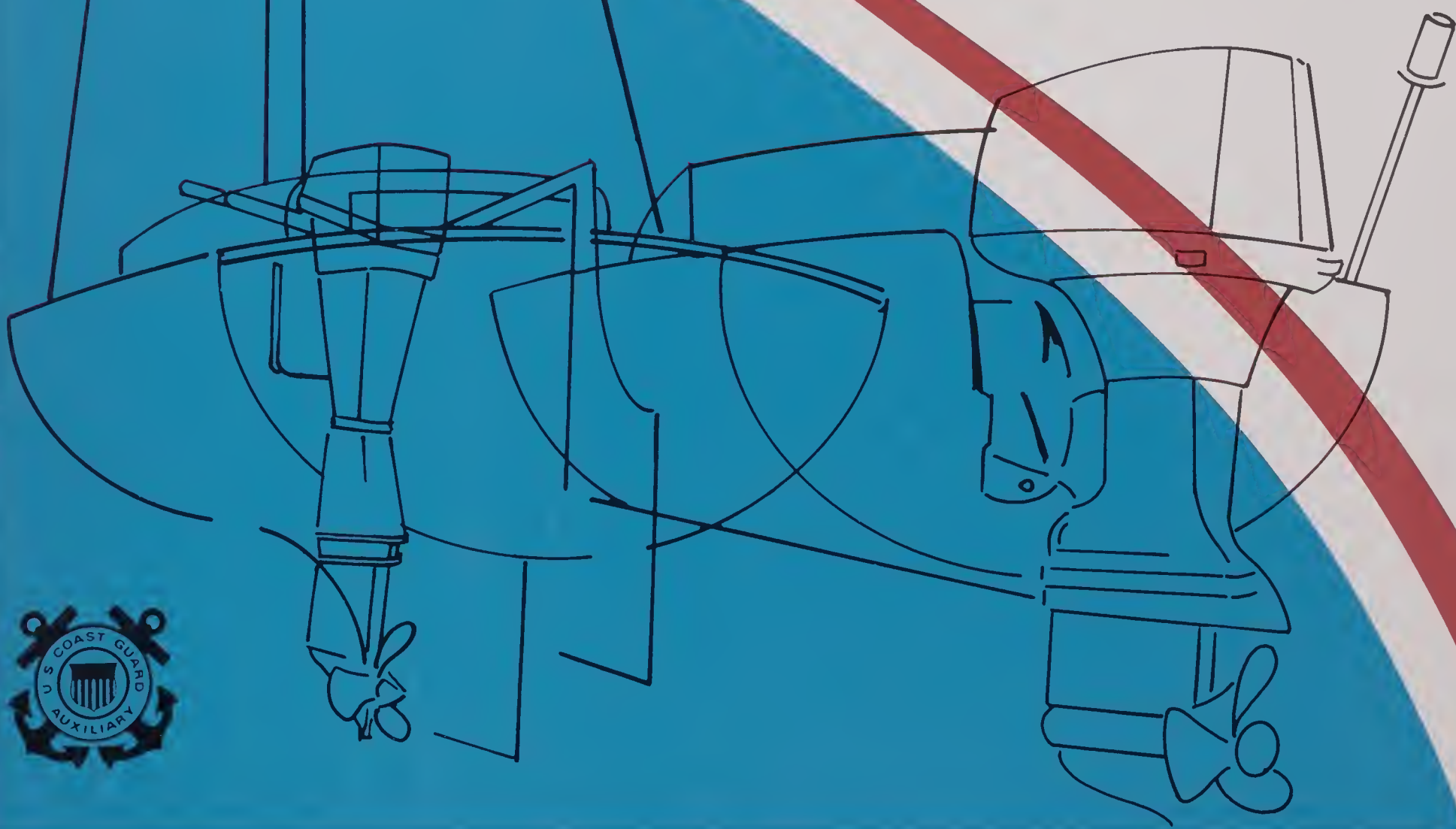
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BASIC BOATING



U.S. COAST GUARD AUXILIARY

BASIC BOATING

U.S. COAST GUARD AUXILIARY
THREE LESSON BOATING COURSE



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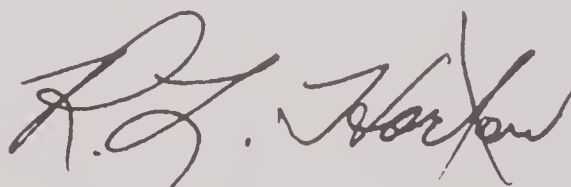
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Welcome to the world of pleasure boating

The U. S. Coast Guard Auxiliary, a nationwide, civilian organization of your boating neighbors, is presenting this course as part of its continuing effort to promote safety in the boating field. Although a small charge is made to cover expenses of presenting this and other auxiliary courses, the auxiliarists who teach serve, like all members of the Coast Guard Auxiliary, without remuneration.

We hope you will find BASIC BOATING interesting and instructive. We also hope you will want to investigate the advantages of membership in the U. S. Coast Guard Auxiliary. For more information, ask one of the auxiliarists presenting this course.

Best wishes for a successful completion of this course as well as an enjoyable safe boating career in your leisure time.



ROBERT L. HORTON
National Commodore

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Chapter 1

Introduction to Pleasure Boating

Introduction

Today's amateur boatman must learn, in his or her spare time, the complexities of small craft handling that have been developed over centuries. This text and the three-lesson course that accompanies it will teach you such basics as your legal and moral responsibilities afloat, selecting and operating typical small boats, aids to navigation, rules of the nautical road, and principles of boat trailering.

It is not our intent (nor is it possible) to make expert small boat handlers in the time allotted. Only application of what you read and hear, further study, and experience can do that. Your instructors can suggest further Auxiliary courses for both sailors and powerboat skippers. Learn the fundamentals thoroughly and use them under normal conditions in good weather, and you should encounter no problems you cannot handle.

Boat Types

A boat is defined as a watercraft of virtually any size or kind, depending on who is doing the defining. Normal characteristics of the major boat types used on inshore waters are as follows:

Rowboat: up to 16 feet in length, but usually smaller. Has a flat bottom with one or more protective strips called **skegs** running its length.

Interior contains two or more simple cross seats. Oarlock sockets are provided. A small motor may be mounted on the transom — the cross piece at the stern or rear of the boat. Simple, inexpensive and not very fast. Often constructed of sheet plywood.



1-1 Rowboat

Dinghy: a rowing or sailing boat used to carry passengers to and from a larger vessel. Often round-bottomed and quite tippy. Up to about 12 feet in length.

Utility: as the name implies, a general-purpose boat of varying size and shape, suitable (but not specifically designed) for fishing, waterskiing and load carrying. Up to about 20 feet in length.



1-2 Sailing Dinghy

Runabout: fast and sporty powerboat often used for waterskiing at high speeds.



1-3 Runabout

Jonboat: a rowing or slow outboard boat, often made of aluminum, with squared ends. A good load carrier.

Hull Types

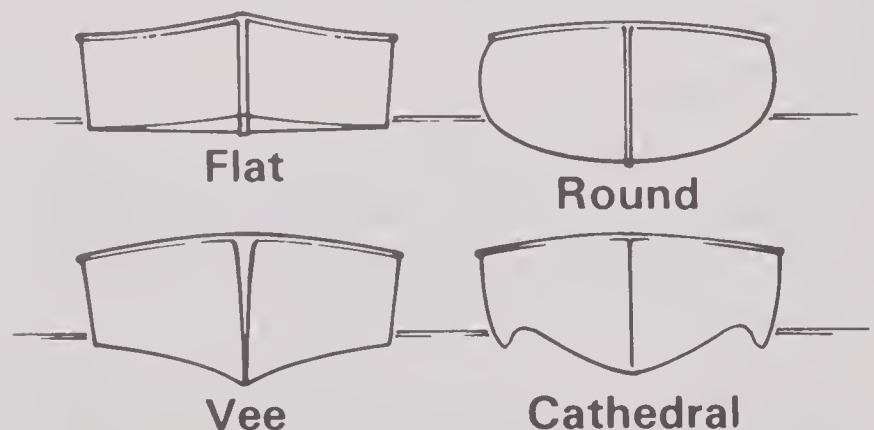
The underwater part of the boat is in many ways its most important aspect. Flat and round bottom boats appear in cross-section much as one might



1-4 Jonboat

expect. Flat bottom boats are quite stable, unless a heavy load is applied to one side, when they may tip over suddenly, while round bottom craft are always easy to tip. A disadvantage of the flat bottom type is that as speed is applied, its bottom can pound the water unmercifully. V-bottom boats avoid this problem but the deep-V style, in which the hull shape is carried from one end to the other, is unstable at slow speeds and consumes a good deal of fuel. Ordinary V-bottom boats have the sharp shape only at the bow, or forward, end: the hull becomes flatter as one moves toward the stern, and this minimizes pounding at normal speeds while giving good stability. Other boats that do this well are the so-called gull-wing or cathedral hulls, which look in cross-section somewhat like the wings of an oncoming sea-gull.

It has truly been said of boat design that one may have any two of the three most desirable attributes — performance, economy, or comfort — but seldom all three. Every boat is a compromise, and the prospective buyer must weigh his individual requirements honestly before deciding. A boat of a type widely used on the waters you plan to cruise is seldom a bad bargain, just as a very unusual kind of boat for your area is often not a happy choice.



1-5 Hull Types

Boat and Motor Selection

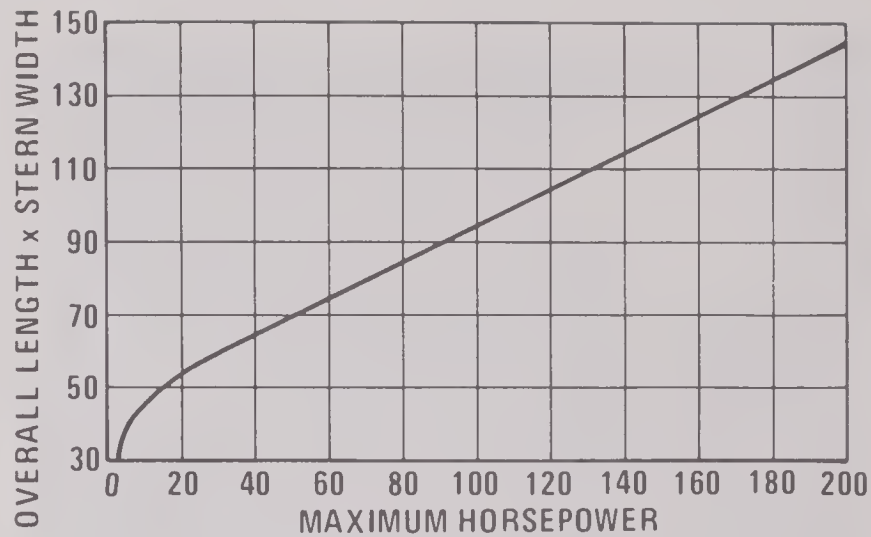
The proper motor and boat combination is vital for safety as well as performance: Too small an engine, and a boat cannot get out of her own way. Too large a motor, and you run the risk of having the boat charge out of control. Newer boats are required by law to display a capacity plate showing the maximum weight the boat was designed to carry, as well as the maximum horsepower of the motor. This information is extremely important, and you should never consider a boat that has a capacity too small for your normal crew and their normal gear.

Older boats sometimes don't have a capacity plate, but it's not hard to figure out the proper size



1-6 Capacity Plate

of outboard motor to install. The boat horsepower curve shown below is easy to use: multiply length of boat (in feet) times width of boat at the stern (also in feet). Find the equivalent number in the left-hand column. Follow the appropriate horizontal line across to the right of the graph until it intersects the horsepower curve. Directly below the intersection is the number indicating the maximum horsepower engine for your boat.



1-7 Horsepower Curve

Types of Engines

Most boats under 20 feet long have one or the other of two basic engine and drive systems. The outboard motor is a portable engine, drive shaft, propeller and steering system in one unit, with a separate plug-in fuel tank containing a mixture of gasoline and oil. Outboards range in power up to immense engines of 200 horsepower, removable only with a crane. The whole motor swivels on its bracket to direct the propeller stream and steer the



1-8 Outboard Mounted on Boat



1-9 Outdrive

boat, and the engine may also be pivoted out of the water, allowing the boat to be beached.

Other small craft — and many larger ones — employ the outdrive (also known as the stern drive, I/O, or inboard-outboard). An engine like the one in your car is mounted inside the boat and connected through the transom — the flat section across the stern — to a swiveling, tilting lower driving unit like the bottom half of an outboard. Outdrives allow for larger engines on a boat, with the weight somewhat more fairly distributed. They are also more complex and more costly than outboards.

Loading and Capacity

As we saw above in our discussion of the capacity plate, a boat's proper load consists of all the things in it — engine, fuel, people and equipment. In a small boat, individual weights have a great effect on the boat's stability and must be carefully considered. Remember the following basic rules about

loading:

Keep the load as low as possible — that includes passengers!

Don't overload — the total of gear, people, and engine should not exceed the figure on the capacity plate.

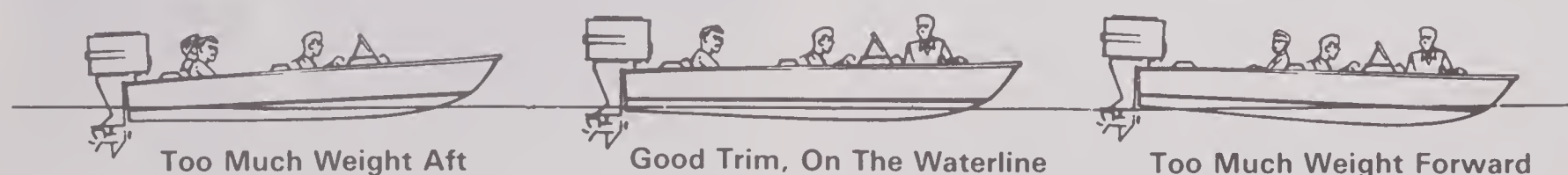
Distribute the load evenly — the boat at rest should float so that her waterline is even with the water and visible.

The number of seats in a small boat is not an indication of the number of people the boat was designed to carry. Rather, the extra seats are installed to allow different combinations of people and equipment to be distributed evenly.

Loading Gear

If you stand up in a small dinghy, the boat suddenly becomes unstable. To a lesser extent, the same thing happens when passengers and/or equipment are placed high in a larger boat. The lower down heavy weights can be placed, the more stable the boat will be.

With a new boat, it often helps to load everything — including all the crew and someone to stand in for the skipper — then stand off at a distance and note whether the boat is riding evenly. If it is down at the bow or stern, or tipped to one side, the load should be redistributed so the hull sits evenly. Under way, the boat should ride with the bow slightly higher than the stern. If the bow is too high, the boat will have trouble attaining full speed and will pound badly. Bow-down boats push a lot of extra water and may even run themselves under in a heavy sea. Either way, a lot of fuel is used to no good purpose.



1-10 Load Distribution in Boat



1-11 Boat Underway - Bow Slightly High

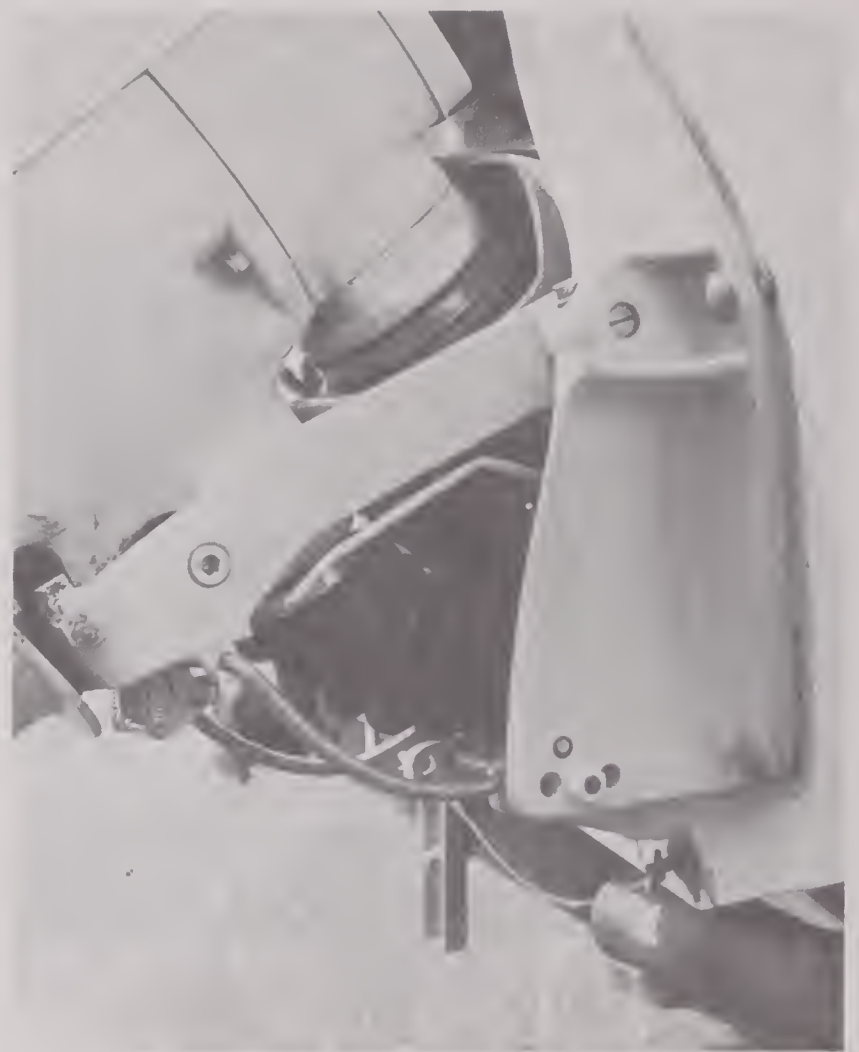


1-12 Tilt Adjustment for Outboard

Permanent bow up or down problems may be corrected by an adjustment of the drive shaft and propeller, as shown in the illustration. Flaps called **trim tabs**, at the stern, may also be added to the hull to level the boat.

Anchoring

The boatman's anchor has been around for several thousand years in forms not unlike those used today. Yet many otherwise good skippers fail to understand its function. Whatever their shape, all anchors work in basically the same way. A blade,



1-13 Tilt Adjustment for Outdrive

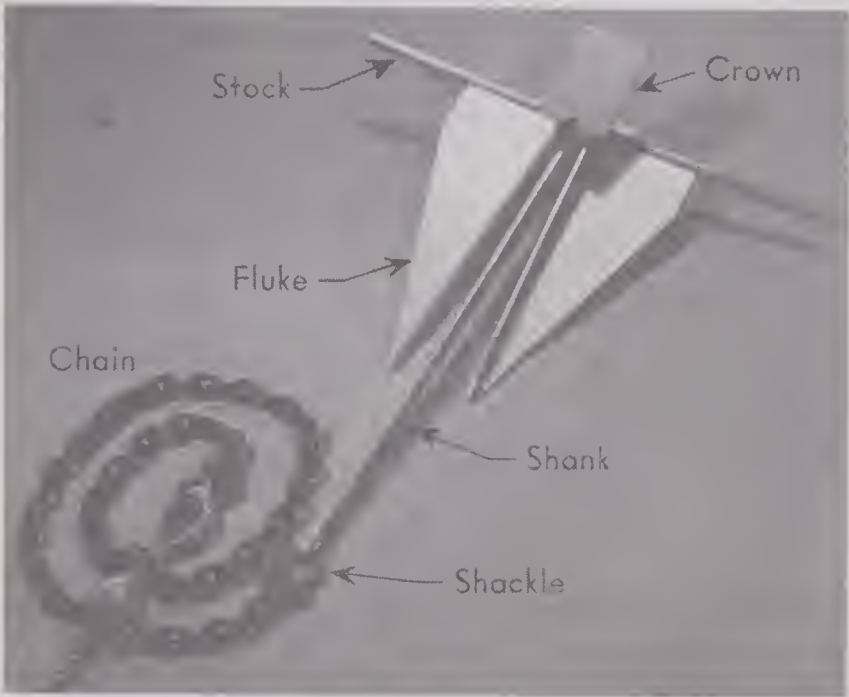


1-14 Trim Tabs

called the **fluke**, penetrates the bottom while the pull from the boat is directly down along the anchor line to the **shank**.

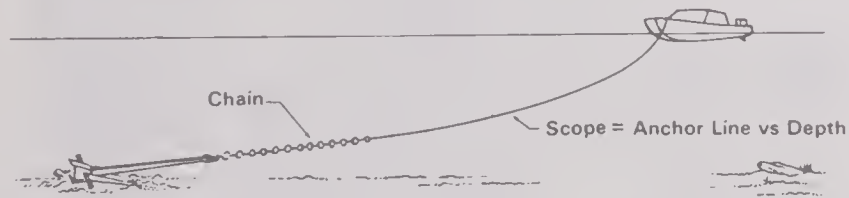
For maximum effectiveness with any anchor, the shank should be as nearly parallel to the bottom

as possible. This enables the fluke to dig in as firmly and deeply as the anchor's design allows — in many cases, a prolonged pull will cause the anchor to bury itself completely.



1-15 Anchor

For the shank to lie flat along the seabottom, it's obvious that the anchor line must pull in that direction, too. And to achieve that line of pull, one must use an anchor line of considerable length, relative to the depth of the water. This line-to-depth ratio is called *scope*, and the proper amount varies with the roughness of the water.



1-16 Scope

Under normal conditions, for short-term anchoring, a scope of 5 to 1 — that is, five feet of anchor line for every foot of depth from the bottom up to the boat's deck — is considered adequate. If the boat is going to be left unattended, a scope of 7 to 1 is better. If you're anchoring in a storm, a 10-to-1 scope is usually about right. In many of today's crowded harbors, of course, a 10 to 1 scope is out of the question: there just isn't that much swinging room left. In such areas, a length of chain between

anchor and anchor line, or even an anchor line entirely of chain, will by its weight help flatten the angle between the anchor's shank and the bottom, and reduce the amount of scope required.

In addition, chain is more durable than rope, and so it makes a good insulator down near the sea bottom, where sharp rocks and debris may chafe the rope anchor line severely. Because of its weight and great strength, chain is usually used in permanent anchoring arrangements, called moorings, where the anchor will not be raised for months at a time.

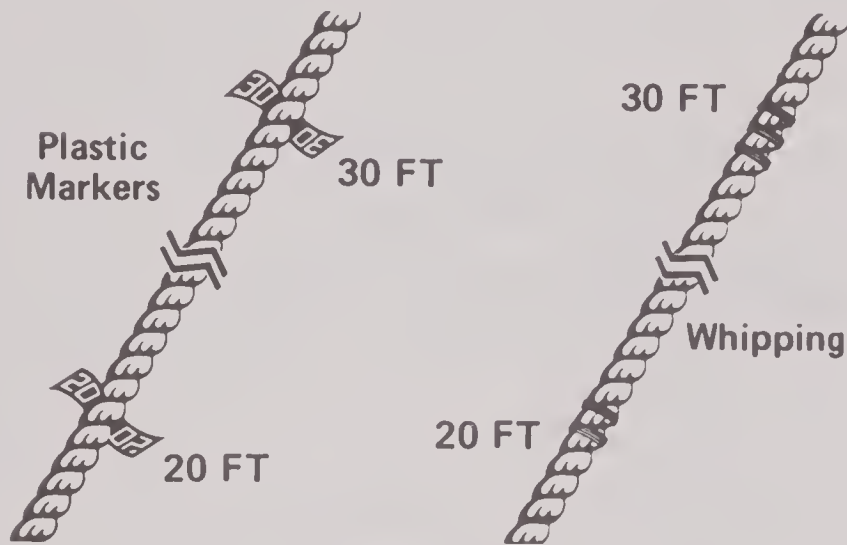
When anchoring your boat, a few tips will help you do it correctly. First, find a good anchorage — free from waves, traffic and wind. Even more important is the type of bottom (indicated in abbreviated form on your chart): Hard sand, clay, stiff mud — all are good. Soft mud, gravel, shells, and weeds are bad.

S.		Quality of the Bottom						
1	Ground	25	Ms	Mussels	50	spk	Speckled	
2	S	Sand	26	Spq	Sponge	51	gly	Gritty
3	M	Mud, Muddy	27		Kelp	52		Decayed
4	Oz	Ooze		Wd	Seaweed	53	fly	Flinty
5	Ml	Marl	28	Grs	Grass	54	glac	Glacial
6	Cl	Clay	29		Seatangie	55		Tenacious
7	G	Gravel				56	wh	White
8	Sn	Shingle	31		Spicules	57	bk	Black
9	P	Pebbles	32	Fr	Foraminifera	58	vi	Violet
10	St	Stones	33	Gl	Globigerina	59	bu	Blue
11	Rk, rky	Rock, Rocky	34	Di	Diatoms	60	gn	Green
11a	Blds	Boulders	35	Rd	Radiolaria	61	yl	Yellow
12	Ch	Chalk	36	Pt	Pteropods	62	or	Orange
12a	Ca	Calcareous	37	Po	Polyzoa	63	rd	Red
13	Qz	Quartz	38		Cirripeda	64	br	Brown
13a	Schist		38a		Fucus	65	ch	Chocolate
14	Co	Coral	38b		Mattes	66	gy	Gray
(Sa)	Co Hd	Coral head	39	fne	Fine	67	lt	Light
15	Mds	Madrepores	40	crs	Coarse	68	dk	Dark
16	Vol	Volcanic	41	sfr	Soft			
(Sb)	Vol Ash	Volcanic ash	42	hrd	Hard	70		Varied
17	La	Lava	43	stf	Stiff	71		Uneven
18	Pm	Pumice	44	sml	Small			
19	T	Tufa	45	lrg	Large			
20	Sc	Scoriae	46	stk	Sticky			
21	Cn	Cinders	47	brk	Broken			
22	Mn	Manganese	47a	grd	Ground	76		Fresh water springs in sea bed
23	Sh	Shells	48		Rotten			
24	Oys	Oysters	49		Streaky			

1-17 Chart Abbreviations for Bottom Type

Approach the chosen spot into the wind, very slowly. Bring the boat to a stop, and as the wind

begins to move her backward, lower — don't hurl — the anchor slowly over the side. When you feel it touch bottom, note the depth (many skippers mark the depths on their anchor line): continue to



1-18 Depth Markings on Anchor Line

pay out line until the scope is at least three to one. Now cleat the anchor line and put the engine in reverse, to dig in the anchor flukes. If the anchor catches, the anchor line will become taut. Shut off the engine and let out the rest of your scope. If it doesn't catch, try more scope, then if that doesn't work, raise the anchor, check for weeds on it or rocks jammed in it, and try again.

To raise the anchor, move the boat ahead slowly, taking in line as you go, until the anchor line is straight up and down. If you can't pull the anchor free, cleat the line and put the engine in forward. If that doesn't work, try running the boat in a circle around the anchor, thus varying the angle of pull.

Refueling

The portable fuel tank for a small boat should never be refilled in the boat. Place it on the dock or somewhere away from the boat so that any spillage will not get into the bilge of the boat to create unnecessary hazards. The same precaution should be taken when adding or mixing oil with the fuel.

A boat with an installed tank should have the fill pipe located outside the cockpit so that any spills will run overboard. When filling, the hose nozzle should be held in firm contact with the metallic fill pipe to avoid sparks.

If there are any closed spaces on your boat, be very sure they are thoroughly ventilated before starting your engine or doing anything which might create a spark. Remember that gasoline vapors are extremely explosive and that this is one of the major causes of boating accidents.

Chapter 1

TEST YOURSELF

Choose the correct answer for each question.

(The correct answers are given at the end of the text.)

1. One of the outstanding characteristics of a row-boat is
 1. High potential speed
 2. Round bottom
 3. Flat bottom
 4. Steel construction
2. The main use of a dinghy is to
 1. Serve as a tender to larger vessels
 2. Pull waterskiiers
 3. Cruise overnight
 4. Fish from
3. An ideal boat for general use is the
 1. Runabout
 2. Utility
 3. Dragster
 4. Dinghy
4. Flat-bottom boats
 1. Tip easily at first
 2. Never tip at all
 3. May tip when loaded unevenly
 4. Cannot pound at high speed
5. V-bottom boats
 1. Pound more readily than flat-bottom boats
 2. Are actually round-bottom
 3. Are also called gull wing boats
 4. Are unstable at slow speeds
6. When selecting a boat, one should
 1. Expect to compromise
 2. Weigh one's requirements honestly
 3. Seriously consider a boat with local popularity
 4. All of the above
7. The boat and its motor should be
 1. Matched to each other
 2. Bought separately
 3. Chosen without reference to each other
 4. Always built by the same firm
8. The number of seats in a small boat
 1. Indicates the number of people the boat is designed to carry
 2. Is regulated by law
 3. Is designed to allow even weight distribution of varied loads
 4. Is noted on the capacity plate
9. When refueling
 1. Portable fuel tanks should be refilled in the boat
 2. An installed tank should have a fill pipe outside the cockpit
 3. Do not hold the hose nozzle against the fill pipe
 4. Avoid ventilating closed spaces before starting engine
10. An important aspect of successful anchoring is
 1. Proper scope of anchor line
 2. Protection from waves, wind and traffic
 3. Suitable bottom for the anchor to dig into
 4. All of the above.

Chapter 2

Trailer Boating

Introduction

Pulling your boat behind the family car or station wagon can increase your cruising range immensely. However, it is important that the towing vehicle's transmission and shocks be designed for the job expected of them.



2-1 Cabin Cruiser on Trailer

Larger trailerable boats with sleeping accommodations can even be used as travel trailers at campgrounds along the way to the next body of water. Trailering is an art requiring both knowledge and skill, the information presented here is an elementary digest of the subject.

Trailer Selection

In choosing a trailer, it's important to match it

to both the boat that will ride on it and the vehicle that will pull it. The three elements together — trailer, tow vehicle and boat — are an inseparable team. Normally, the length of the boat determines the length of the trailer, and the boat's beam determines the width. As many states have adopted a maximum vehicle width of eight feet for ordinary trailering, that beam is standard on many trailerable craft and one would not normally buy a wider boat to trail, as it would entail special permits in many states.

In terms of effective length, measure the trailer from the aftermost support to the winch on its pillar forward. The boat's transom, with the extra weight of the motor, should receive firm support from below, while the bow of the boat should be close to, and slightly above, the winch at the front end of the trailer.

The boat itself should be firmly and evenly supported at as many points under the hull as



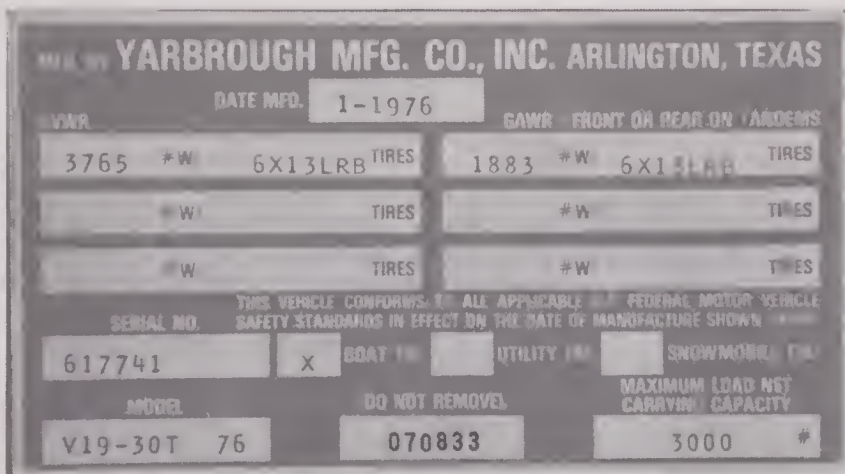
2-2 Trailer Length and Supports

possible. Remember that a boat is designed to be supported evenly by water, not at a few points by rollers. Special support is necessary along the keel and directly under any built-in weight which cannot be removed when trailering.



2-3 Supports Under Boat's Hull

Trailer capacity in terms of the weight it will carry is another factor. Virtually all commercially built trailers have a capacity plate attached to the tongue — the horizontal bar pointing toward the tow vehicle, with the hitch arrangement at its forward end. This plate will show the maximum load for which the trailer is rated by its manufacturer. Remember that this is total load, and includes not only the boat itself but whatever equipment may be in the vessel when it's being trailered.



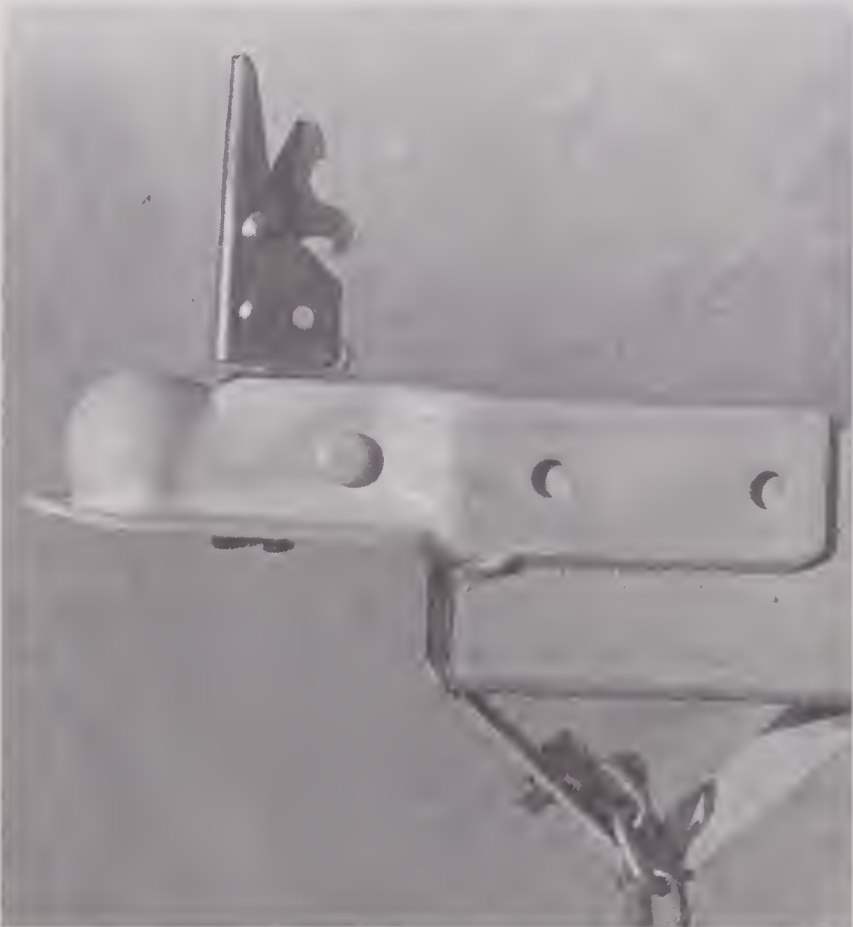
2-4 Trailer Capacity Plate

When buying a winch (if your trailer doesn't already have one), make sure that it, too, can handle the boat's weight, and that the winch cable (which may be rope or wire) has plenty of extra strength beyond that required by the boat's weight.

Most high-quality trailers have a number of adjustments which can be made to the frame to match the pattern of trailer rollers and supports to the boat. When your boat is first loaded on the trailer, take an hour to make sure the boat is evenly supported at as many points as possible. At the least, it'll keep your boat from warping or springing later.

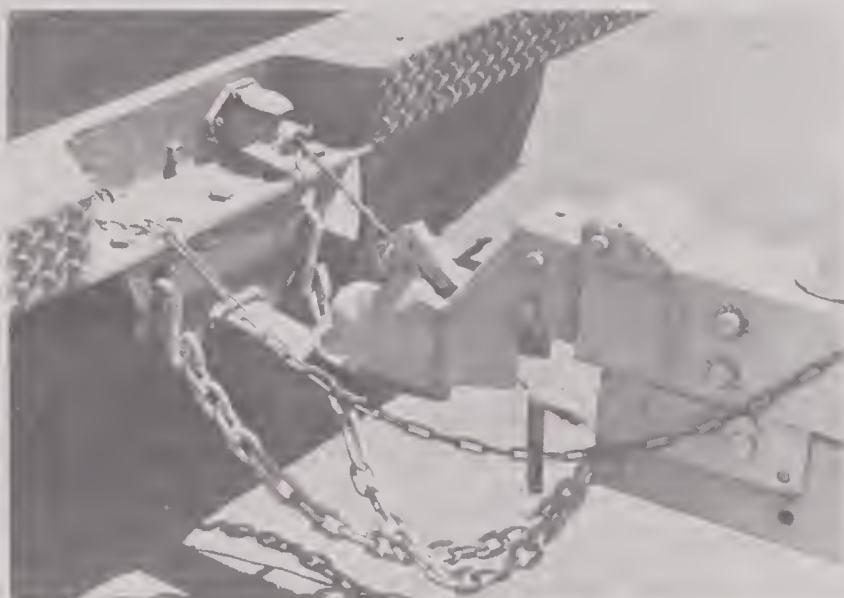
Securing Trailer and Boat

Perhaps the most important single point in the trailer-tow vehicle combination is the joint connecting them. Known as the **hitch**, it usually consists of a socket at the forward end of the trailer tongue, matching a ball mounted on a heavy metal framework at the back of the car or truck. In place, the socket locks around the ball, so the trailer can swing from side to side without leaping free. Safety chains hold the trailer connected to



2-5 Trailer Hitch Socket

the car even if the hitch breaks. The two chains should always be fastened under the trailer tongue, as shown, to support it and keep it from gouging into the road if the ball and socket fail.



2-6 Safety Chains

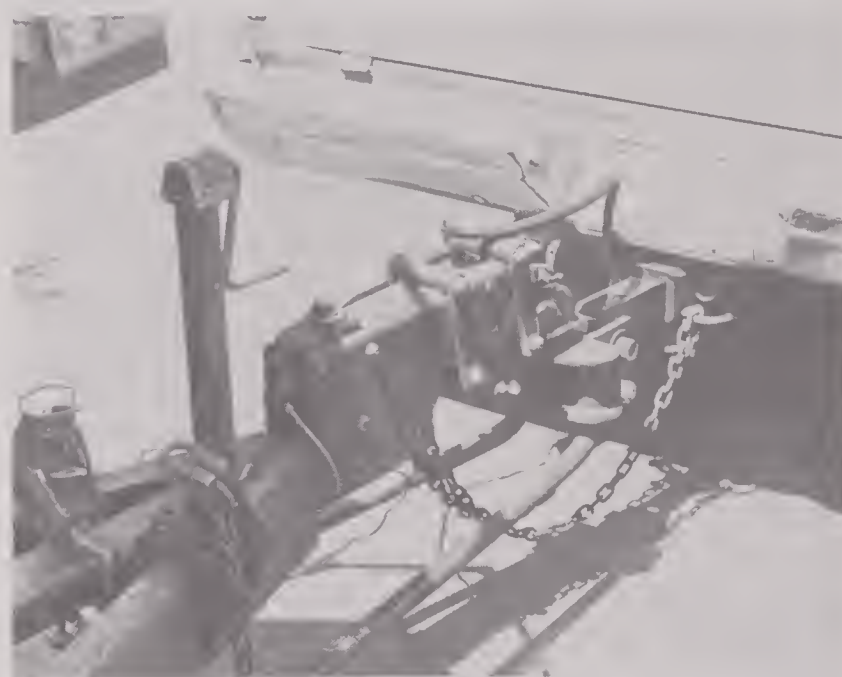


2-7 Bumper Hitch - Inadequate



2-8 Frame Hitch

A bumper hitch, which is a temporary bracket clamped to your car's rear bumper, is inadequate and unsafe for towing boats. Boat-and-trailer combinations weighing up to about 3,500 pounds can be supported by a **frame hitch**, welded or bolted to the tow vehicle's frame. Heavier boat-and-trailer combinations will drag the car's rear end down. A **weight-distributing hitch**, which spreads the load to front and rear axles evenly, is what's required for such large craft.



2-9 Weight Distributing Hitch



2-10 Outboard Motor - Up and Locked

With the boat firmly settled on its trailer, remove all equipment that can be carried in the towing vehicle. Small engines should be detached if possible, and larger engines should be tilted up and locked. No loose equipment should be allowed to rattle about in the boat when on the highway.

In addition, the boat should be lashed in place. Besides the winch line, an additional bow line should hold the boat's nose to the winch column and keep the vessel from lurching backwards when the car starts forward. A wide webbing strap, sold



2-11 Bow Securely Fastened

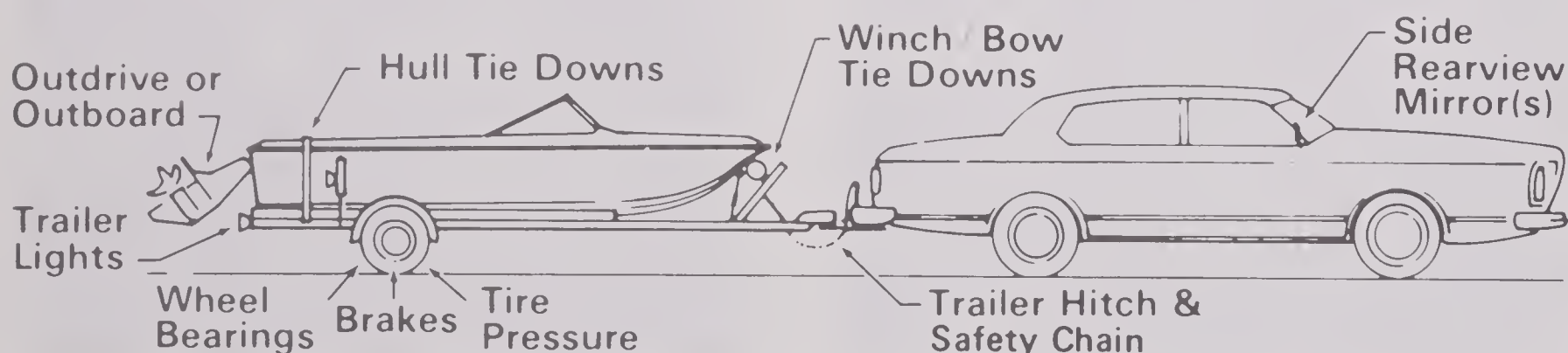
in most trailer equipment stores, should hold the aft end of the boat down on the trailer without scoring the gunwales (as rope would do). A pair of lines, padded where they cross the gunwales, should run from the boat's deck cleat at the bow back to a point on the rear end of the trailer, to keep the boat from riding forward when the trailer is braked.

When everything is in position and the boat is ready to roll, the weight on the foremost tip of the trailer tongue should equal between 5 and 7 per cent of the combined weight of the trailer, boat and gear. That is, if the trailer weighs 500 lbs., the boat weighs 1,500 lbs., and gear aboard weighs 100 lbs. (a total of 2,100), then a bathroom scale placed under the trailer tongue should read between 105 and 150 lbs. This proportion of tongue weight to towed weight will make for easy handling of the tow car and will keep the trailer from fish-tailing.

On-the-Road Precautions

Before leaving, make sure that trailer brake and turn lights are working properly, that the trailer brakes (if you have them) are operating, that the pressure of the air in the tires on the trailer wheels is correct. On the road, stop at least once an hour (and at any time if something feels wrong) to check the following:

1. Boat tie-downs
2. Trailer hitch
3. Temperature of trailer wheel bearings



2-12 On-the-Road Check Points

4. Trailer lights

5. Trailer tire pressure

Driving with a heavy trailer is quite different from handling the family car by itself. Allow extra time to pass other vehicles (and pass only if you must). If your trailer is considerably slower than other traffic on a narrow road, pull off every 15 minutes or so. Others will appreciate it and you may prevent an accident caused by someone trying to pass you. Watch speed limits, which may be lower for trailers than for autos. When turning, signal and brake well in advance, then swing wide to avoid riding the trailer over the corner curb. Allow extra distance between you and the vehicle ahead, and brake early and easily.

Launching

At the launching ramp, set up your boat before putting her into the water. Not only is it easier to rig boats (especially sailboats) on level ground in a parking lot than on a sloping ramp, but you will also be out of others' way and you will give your trailer wheel bearings time to cool off: If immersed when still hot from highway speeds, the bearings may well suffer considerable damage. If you have a sailboat with a metal mast or rigging, make absolutely sure that there are no overhead wires between you and the launching ramp before you set up the mast. Several people have been electrocuted when their boat's rigging struck such wires.

The trailer's lights (if they are low enough to be immersed) should first be removed and the boat freed of its tiedowns. Back the tow vehicle slowly down the launch ramp until the boat's stern is at least partially supported by the water. A bow line should be made fast and handled by someone ashore, while a second person releases the winch line and eases the boat off the trailer. Leave the car engine running while launching, with the parking brake set and, for automatic transmissions, the gear lever in Park.



2-13 Launching - Disconnect Lights



2-14 Launching - Remove Tiedowns

Recovery

Recovering the boat is like launching, only reversed. Once the boat is eased aboard the trailer and lined up so the rollers support the hull, make fast the winch line and winch the boat into position for trailing before pulling up off the ramp. If the trailer hubs are immersed either during launching or recovery, check them to make sure wheel bearings are still fully packed with grease before driving off.



2-15 Launching - Back Boat to Water



2-16 Launching - Ease Boat Off Trailer

Maintenance

After each use, especially in salt water, the trailer should be hosed off with fresh water, the wheel bearings and lights checked, and the frame bolts tightened. Out of season, the boat may be left on the trailer, but the trailer frame should be blocked up at the corners to take weight off the wheels and springs. A cover that keeps the trailer dry, as well as the boat protected, is a good idea, too. Touch up dents with rust-proof paint.

Your trailer needs spare parts just as your car does. Make sure you carry the following with you:

1. Complete spare wheel
2. Wrenches to fit trailer frame bolts
3. Wheel bearing grease
4. Brake and turn light bulbs
5. Jack (if your car's bumper jack won't fit the trailer)
6. Spare wheel bearings



2-17 Trailer Care

Chapter 2

TEST YOURSELF

Choose the correct answer for each question.

1. In trailering your boat, the three elements that must be matched are
 1. Boat, trailer and road
 2. Boat, road and tow vehicle
 3. Trailer, tow vehicle and boat
 4. Boat, trailer speed and weight
2. On a trailer, the boat should be supported
 1. At as many points as possible
 2. Never beneath the transom
 3. Directly under the winch
 4. All of the above
3. The joint connecting tow vehicle and trailer is called the
 1. Sprocket
 2. Hitch
 3. Bumper
 4. Tongue
4. In hitching the boat trailer to the towing vehicle do not use a
 1. Frame hitch
 2. Weight-distributing hitch
 3. Safety chain
 4. Bumper hitch
5. To hold a boat on the trailer, one may use
 1. The winch line
 2. A webbing strap over the aft end of the boat
 3. A pair of lines running from the bow to the rear of the trailer
 4. All of the above
6. If a trailer weighs 200 lbs., the boat on it weighs 700 lbs., and the gear in the boat weighs 100 lbs., the weight on the trailer tongue should be
 1. 100-150 lbs.
 2. 50-70 lbs.
 3. 1,000 lbs.
 4. 5-7 lbs.
7. When trailing your boat, you should stop at least once an hour to check
 1. Trailer lights
 2. Boat tie-downs
 3. Weather reports
 4. 1. and 2. above
8. When launching a sailboat with metal mast or rigging, be sure to
 1. Avoid electrical wires between you and the launching ramp
 2. Immerse trailer wheel bearings before launching
 3. Choose a sloping ramp on which to rig the boat
 4. Turn off trailer lights while under way
9. After the boating season, a boat
 1. Cannot be stored on its trailer
 2. Must be stored only on its trailer
 3. Can be stored on the trailer, if the frame is blocked up
 4. Should invariably be left afloat
10. Which of the following is **not** a useful spare part for the trailer boatman
 1. Spare wheel bearings
 2. Complete spare wheel
 3. Spare turnbuckle lifter
 4. Brake and turn light bulbs

Chapter 3

Aids to Navigation

Introduction

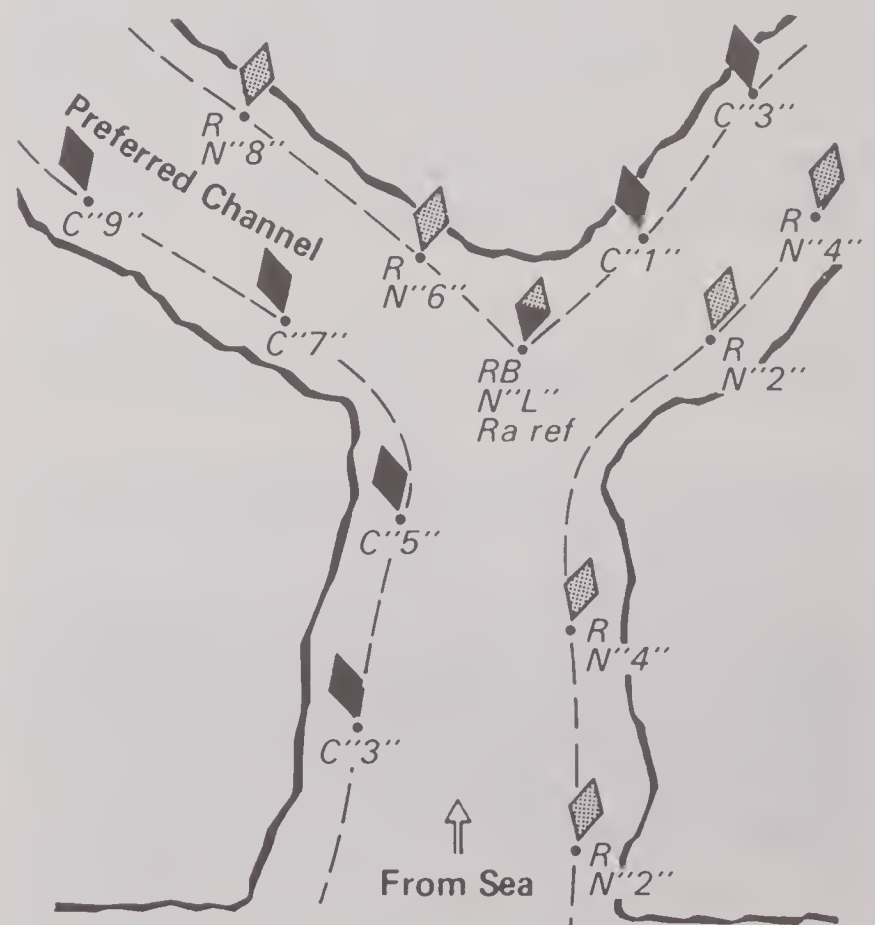
The land traveler has no difficulty telling when his car is on or off the road, but a seafarer has the problem of knowing which areas of water are safe to traverse and which are not. In addition, there are relatively few natural landmarks along the water's edge, and this makes it much easier to become lost, even near shore. For these reasons, the U.S. Coast Guard has designed, built, and maintained the world's foremost system of manmade devices to mark dangers in the water (such as reefs), to aid mariners in locating their positions and to signpost the deep water channels which are safest for shipping.

Aids to Navigation

These devices — there are more than 40,000 of them in U.S. waters — are known collectively as **aids to navigation**, and while there are many types and styles, in this course we shall concentrate on the most familiar, the ones most skippers will see and use on the water every day. Collectively, these are known as the **Lateral** system of buoyage.

For the sake of convenience, we will divide these aids according to their function —

Channel markers: A channel is the deepest, most obstruction-free pathway a ship or boat can follow. While small craft seldom need to stay within a channel, the markers that line it on either side (and sometimes indicate its center) are useful position indicators for every mariner. In marking any channel, it is presumed that one goes from a large body of water to a small. Thus, a channel begins at the sea; a secondary channel begins at the point



3-1 Channel Marking

where it diverges from the main channel. Channel markers may be fixed markers or lights, or may be floating buoys. Proceeding from seaward, red markers and buoys are on the right-hand side, black or green markers and buoys on the left. Many people find it easy to remember this fact by memorizing the three-word phrase "Red-Right-Returning" (from the sea).

Lighted buoys on either side and fixed lights have no specified shapes, but lights on the right-hand side returning will be either red or white, lights on the left green or white. Unlighted buoys marking a channel's sides are also red or black. They also have distinctive shapes: red unlighted buoys are called **nuns** and are shaped like cones, point up, with the tip of the point flattened. Black buoys are called **cans** and are cylinder-shaped.

All aids to navigation on the right side of a channel are red and even-numbered, beginning with 2 nearest the sea; all black aids are odd-numbered.

The middle of a channel may be marked by a black-and-white buoy. It can be any shape, shows a white light, and is striped vertically. Where a channel splits in two, or when there is an obstruction in the channel, that point is marked by a buoy striped red and black in horizontal bands. It may be any shape and, if lighted, shows a red, green or white light. Neither mid-channel nor obstruction-junction buoys have numbers.

Special purpose aids: These may be of any shape, and they indicate some special condition of interest



3-2 Special Purpose Aids

or importance to the mariner. Anchorages, fish trap areas, wrecks, dredging operations — all these are commonly marked with special-purpose buoys. More common are the special-purpose markers of the Uniform State Waterway Marking System. These are white buoys, usually can-shaped, trimmed with International Orange. They indicate controlled areas (speed limits, no anchoring, etc.), dangers, or information such as direction arrows.

Location aids: Certain aids — usually large light-houses and fixed lights — may have no particular directional meaning, but simply serve as obvious orientation. Seacoast lights, which can be identified by light pattern or by radio beacon from miles out in the ocean, are perhaps the most obvious example, but many harbor entrances are marked by light-houses or light towers which can be recognized from many miles away.



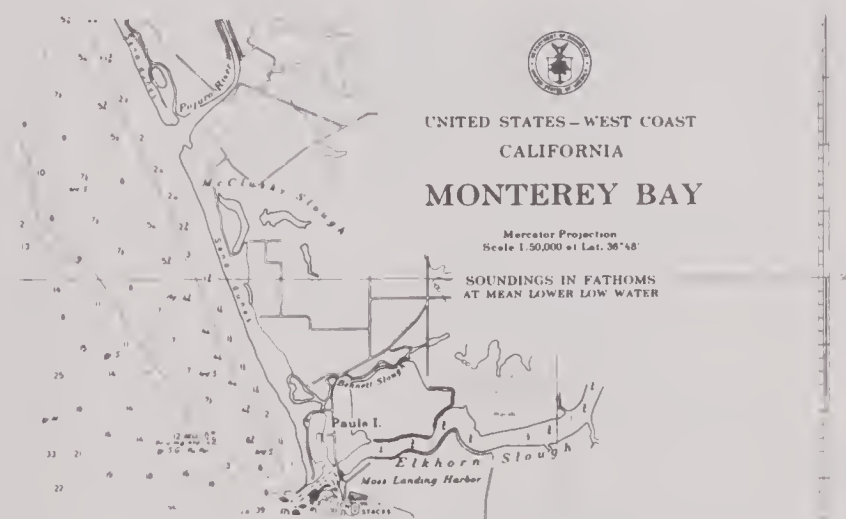
3-3 Lighthouse

The Mariner's Chart

A chart is a form of map, and a map is simply a picture of the earth's surface, drawn to scale and illustrated with symbols. Let's examine that definition a bit more closely. We can see in our mind's eye a photograph of the earth's surface: thanks to modern rocketry, we see such pictures often, and a map doesn't resemble them a great deal. For one thing, a map is rendered symbolically, to make it clearer and easier to read. On a given map, the water is one color, the land another, highways are drawn in red, buildings may be represented as tiny squares no matter what their real shape. In addition, a map is drawn to a predetermined scale, which simply means that everything on the map is reduced by the same percentage of original size.

A chart is a map which concentrates on matters of interest to the seafarer. That means it shows land objects which can be seen from a boat; it gives depths of water and heights of such structures as bridges and overhead wires.

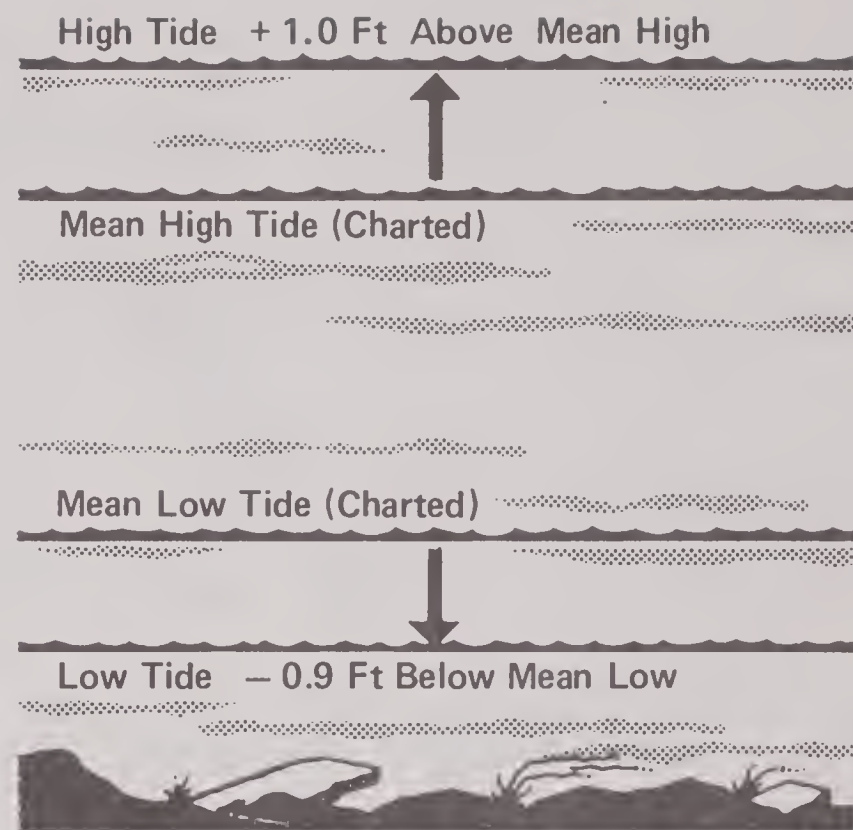
When looking at a chart for the first time, turn first to the Legend, the block of text immediately under the chart title. This will give you the chart scale — the relative size of things on the chart as compared to the same things in reality. Scale is usually expressed as the numeral 1 followed by : and a second number in the thousands or millions 1 : 80,000, for instance, or 1 : 20,000. The first of these scales means that a lake on the chart is 1/80,000 of its real size — that anything on the chart, except items shown in symbols, is 1/80,000 of its real size.



3-4 Chart Legend

On nautical charts, dry land is shown in a light yellow tint; land which is sometimes water-covered is tinted green. Shallow water is shown as blue and deep water as white. Depths of water are normally given in feet at low tide — so that at most times of the day there will be more water under your boat than the chart shows. At certain times, however, extra-low tides will make the water depth less than what's shown, so you must still be careful.

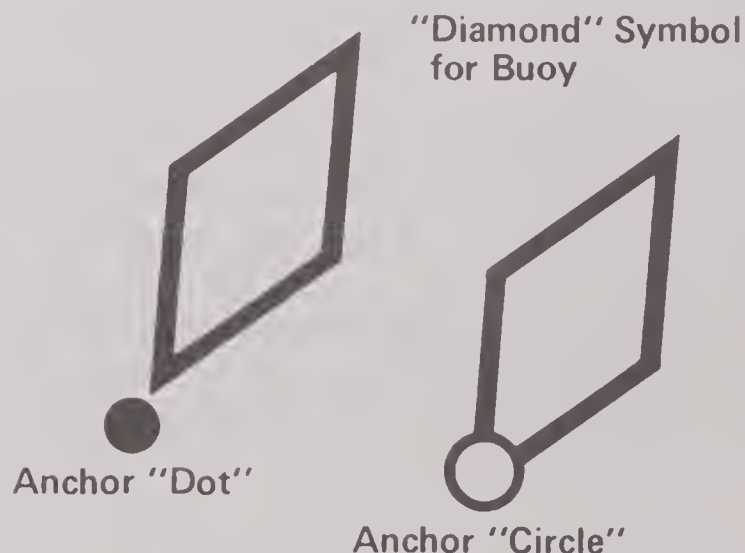
Heights, such as bridges and other overpasses, are given for high tide in tidal areas, so there is normally more clearance than that shown on the chart. Extra-high tides can, however, wipe out this safety margin. Both very high and very low tides occur during full moon and new moon days.



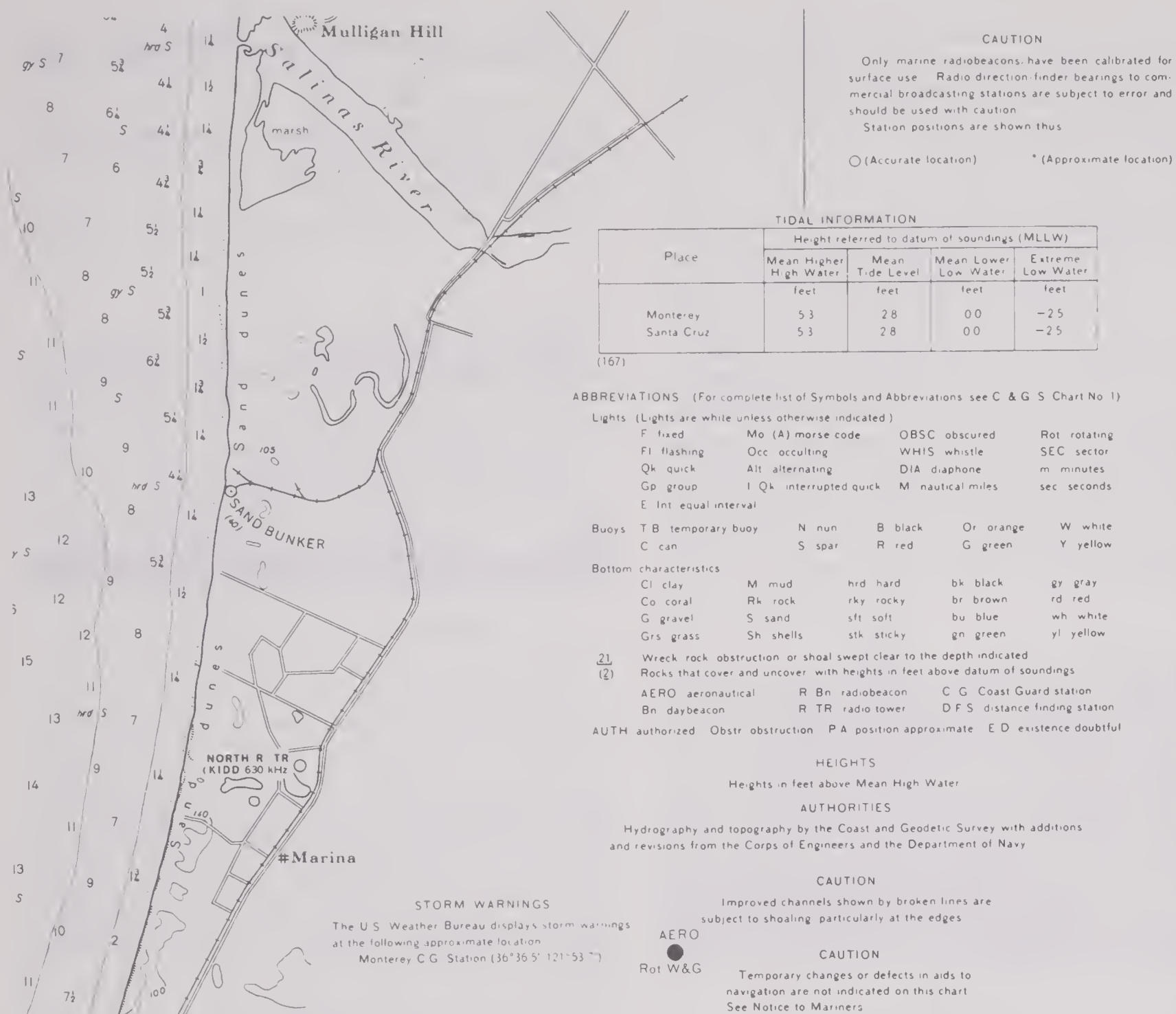
3-5 Clearances from Charted Tide Levels

Many features, such as the consistency of the bottom, marks ashore, and characteristics of lights on aids to navigation, are shown in abbreviated form. Somewhere on each chart is a paragraph of abbreviations covering most of the ones used on that chart. As you become accustomed to chart-work, you'll begin to memorize these abbreviations, and in a short while they'll become second nature to you.

Buoys and fixed aids cannot be shown in their true form on a chart. Instead, buoys are shown as



3-6 Buoy Symbols



3-7 Table of Abbreviations on Chart

diamonds, in colors corresponding to the colors they bear, with a dot beneath the diamond indicating the buoy's exact location or a circle under the diamond indicating the buoy's approximate location. When the dot or circle is surrounded by a magenta (light purple) circle, that means the buoy is lighted. Significant shapes (N for nun, C for can) are noted alongside the diamond, as is the buoy's number which appears in quotation marks ("13", "2") and the characteristics of its light: F for fixed,

Fl for flashing, and so on.

Dangers to the seafarer — rocks, wrecks, etc. — are also shown in symbolic form: Rocks especially concern the boatman, and they appear on the chart as crosses (+) or asterisks (*) when they are considered a danger. There is a vast amount of information on even the smallest chart, and continued study of your local charts will repay the effort many times.

Chapter 3

TEST YOURSELF

Choose the correct answer for each question.

1. Federal aids to navigation are
 1. Designed, built and maintained by the U.S. Coast Guard
 2. Mark dangers in the water
 3. Indicate deep-water channels
 4. All of the above
2. Channel markers may indicate
 1. The edges and sometimes the center of a channel
 2. The precise depth of the water
 3. Small bodies of water
 4. The lateral system of buoyage
3. The key phrase "Red-Right-Returning" means
 1. Always return to red buoys
 2. Red buoys are correct; all others are wrong
 3. Keep red buoys to the right returning from a large body of water to a small one
 4. Keep red buoys to the right returning from a small body of water to a large one
4. Can buoys are usually
 1. Unlighted
 2. Red in color
 3. Black in color
 4. 1. and 3. above
5. Can-shaped white buoys trimmed in International Orange are called
 1. Mid-channel markers
 2. Uniform State Waterway markers
 3. Seacoast lights
 4. Nuns
6. The mariner's chart
 1. Is never drawn to scale, unlike a map
 2. Is a type of map that emphasizes sea and coast features
 3. Shows streets and highways in detail
 4. Always shows water as blue in color
7. A chart scale of 1:20,000 means that
 1. Any object on the chart is 20,000 times its real size
 2. Any object on the chart is shown in symbolic form
 3. Any object on the chart, except symbols, is 1/20,000 its true size
 4. All of the above
8. On most nautical charts, dry land is tinted
 1. Light yellow
 2. Blue
 3. White
 4. Light green
9. The chart symbol for a buoy includes
 1. Its number, if any
 2. Its light characteristic, if lighted
 3. Its shape, if that is significant
 4. All of the above
10. The chart symbol for dangerous rocks is
 1. !
 2. @
 3. ?
 4. * or +

Chapter 4

Maneuvering

Introduction

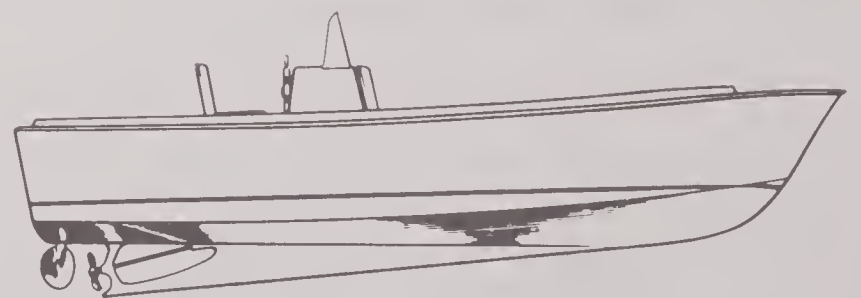
Handling your boat in all conditions of wind or sea is both challenging and demanding: it's also one of the most satisfying talents a skipper can have, and one that comes only with experience. The beginning boatman is well-advised to operate his craft under normal weather conditions and at well-controlled speeds until he knows exactly how she will behave in any maneuver.

Although maneuvering is largely a matter of practice, understanding some basic theory about boat handling will help you figure out what's going on — not to mention what to do next. And this is extremely important: The most valuable habit you can develop as a boatman is the ability to plan ahead; to know not only what to do next but also how to retrieve the situation if something goes wrong.

There are two basic ways in which a boat travels — on the water and through the water. The first mode is called planing, and in it a vessel is moving fast enough so that it partially emerges from the water and skims along the surface. The second, slower type of movement is the displacement mode. A displacement boat cuts or pushes through the water, and its speed is limited by its size and power. All boats at rest are displacement boats, in that any floating object will displace its own weight of water. But high-speed boats can escape from the displacement phase and move far faster.



4-1 Planing Hull



4-2 Displacement Hull

In boat handling, both planing and displacement hulls follow the same general rules, but planing hulls are quicker to respond and are often more temperamental. One can make a mistake in a displacement boat moving five miles per hour, and

have time to correct it. At 20 miles per hour, you may well have an accident before you can correct matters.

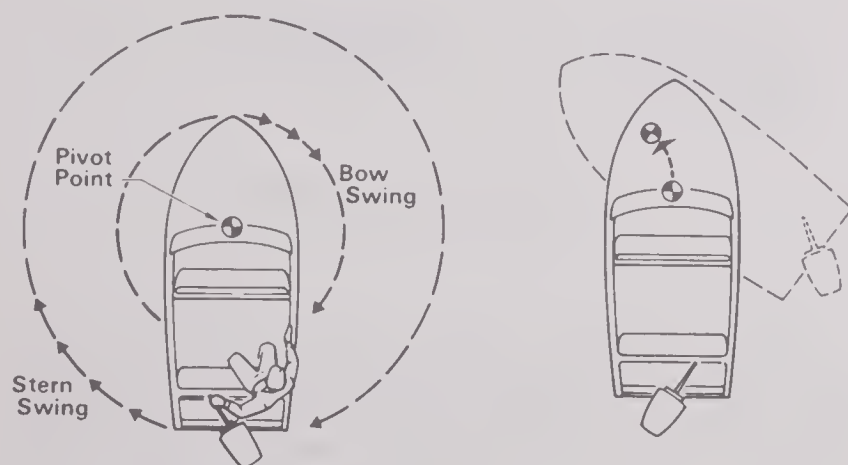
In addition, boats behave differently loaded than empty. Just how much effect a load will have depends on your boat, but the odds are that your loaded boat will be significantly slower – to move, to turn, to stop. She may be somewhat more stable (depending on her hull shape), but she will also be less able to rise and pass over waves. An empty boat is apt to be affected by the wind more than a loaded one – a point to remember when docking.

Outboard and Outdrive Handling Characteristics

Outboard and outdrive boats steer by changing the direction of propeller thrust. This makes for quick and accurate steering in both forward and reverse, but it does mean that there is a significant difference between steering a boat and steering a car. An automobile follows its front wheels around in a circle, and both rear and front wheels stay in the same track. A boat, on the other hand, turns at the rear, with the result that in a turning boat the bow swings inward and the stern swings out, as shown in the diagram.

When steering in close quarters, as around docks or other boats, the skipper should allow for the swing of his boat's stern and keep clear of obstacles. Backing up, the boat will follow its stern, being pulled along by the engine.

The most obvious difference between driving a



4-3 Turning Pivot

boat and a car is the absence of a brake in the former. To reduce speed, one can usually throttle back, and the friction of the water on the hull will slow the boat quickly. But to stop, the engine must be reversed. This works easily and well with planing boats, which subside off a planing position quickly and mush to a halt. But heavy displacement hulls, such as engine-driven sailboats, will frequently coast for a long distance before the reversed propeller will stop them.

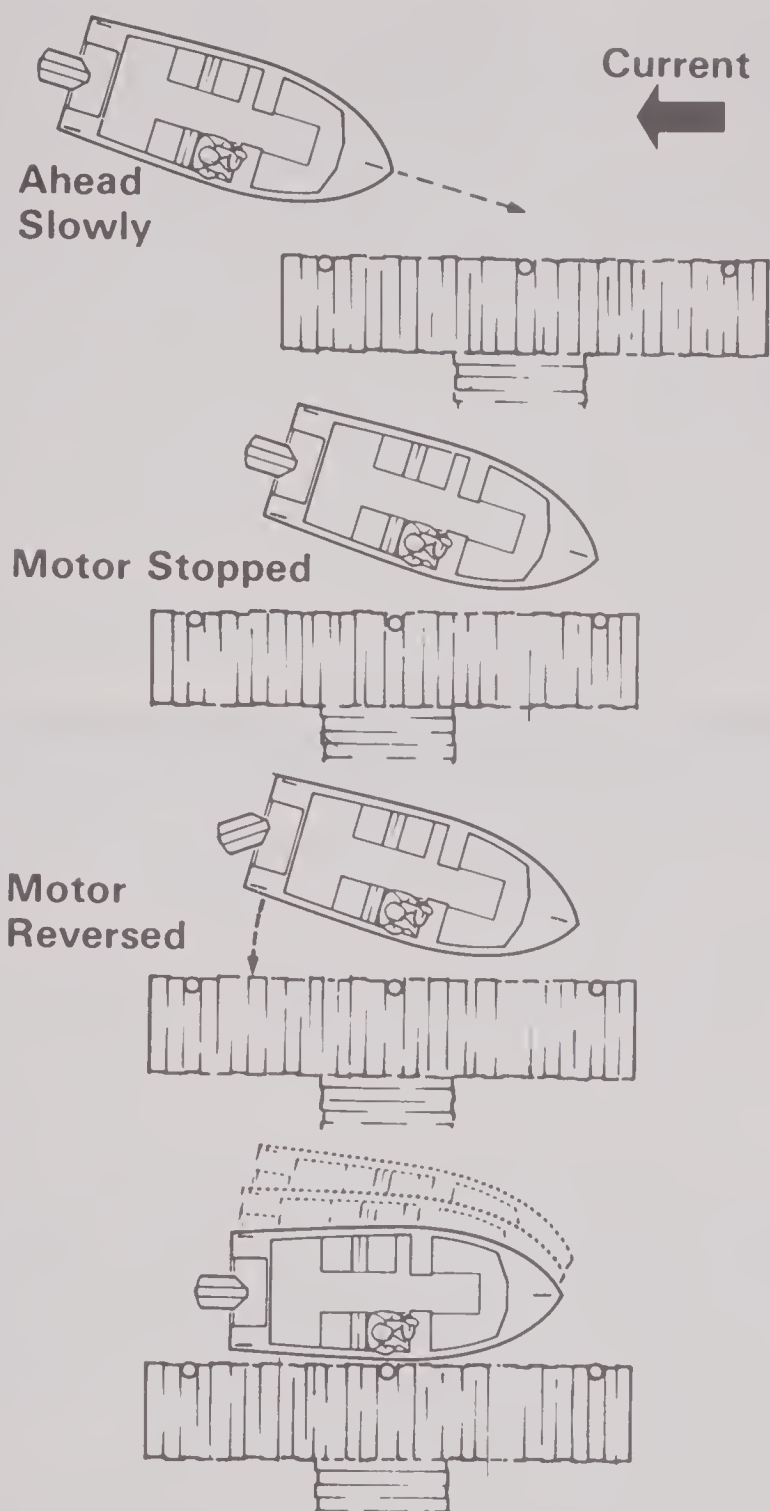
Docking and Undocking

The art of docking is likely to be a very public demonstration of the skipper's skill – or the lack of it. When one has bought a new boat, it's a good idea to spend a full afternoon docking and undocking over and over again, approaching slip or pier from a number of angles, until the boat's behavior on every heading is understood.

Normally speaking, the best way to approach a dock is into wind and current, or into whichever of the two has the most effect on the boat. In this way, the wind and/or current will help slow the boat while allowing the skipper to keep her under control for the final approach. Aim at a shallow angle to the pier and just before the hull touches, put the engine into reverse to stop the boat's forward motion. Now turn the wheel toward the pier and give a light touch of reverse to pull the stern in. With practice, you should be able to lay your boat alongside parallel to the dock and no more than a foot away.

Entering a slip, the normal procedure is to back in. Check the wind or current effect first, if either or both seems likely to sweep your boat across the slip mouth. If the space allotted is short for your boat, you may be best advised to come in bow first, keeping your vulnerable (and valuable) motor or lower unit from getting too near the dock or bulkhead.

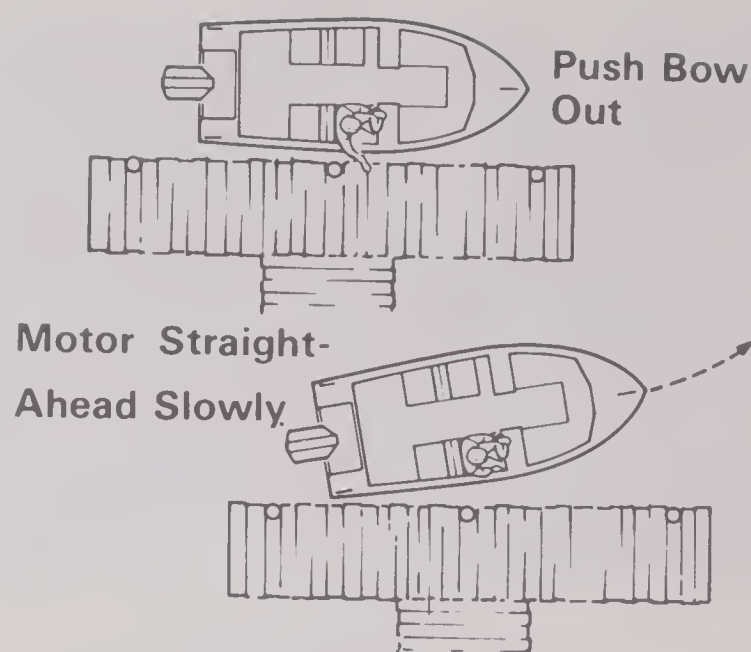
When leaving a dock, remember that turning effect. Trying to drive your boat away as you drive a car from the curb will invariably result in a battered stern. If there's space ahead, push the bow off to make a slight angle with the dock, and ease slowly ahead till you're clear enough to swing out.



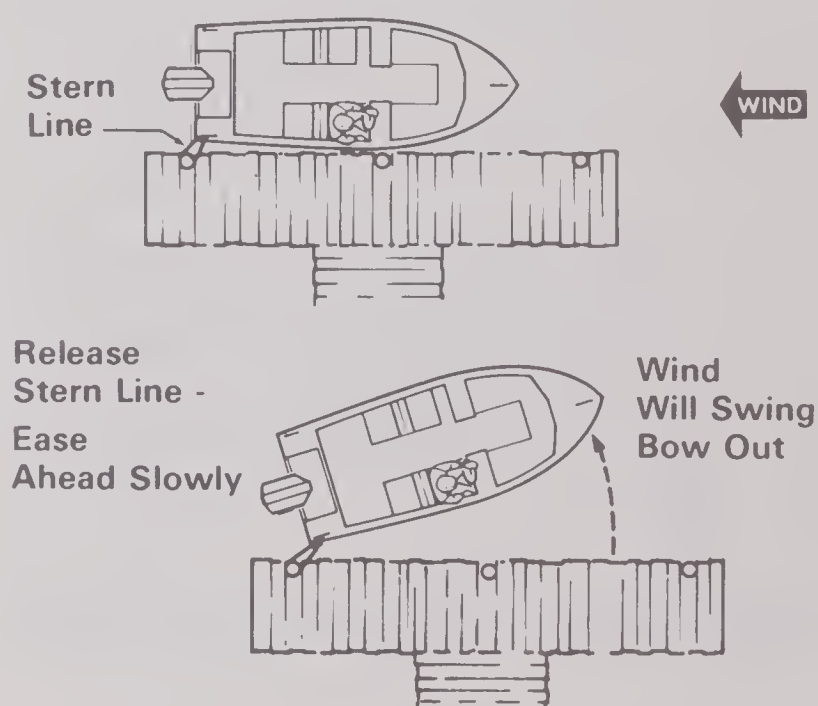
4-4 Docking - Into Current or Wind

With the wind on the bow, simply retain a stern line and let the boat's nose swing clear while the line holds the stern in. Then release the line, engage the gears and ease away.

Sometimes the wind will pin your boat to the pier. Departing under such conditions can be a problem no matter what. Often the best way is to back off. Turn the steering wheel away from the dock, put the engine in reverse, and pull away slowly, cushioning the boat's bow with fenders or cushions where it strikes the pier. To get the stern out first, run a line from the bow aft to the dock,



4-5 Leaving Dock - Watch Stern

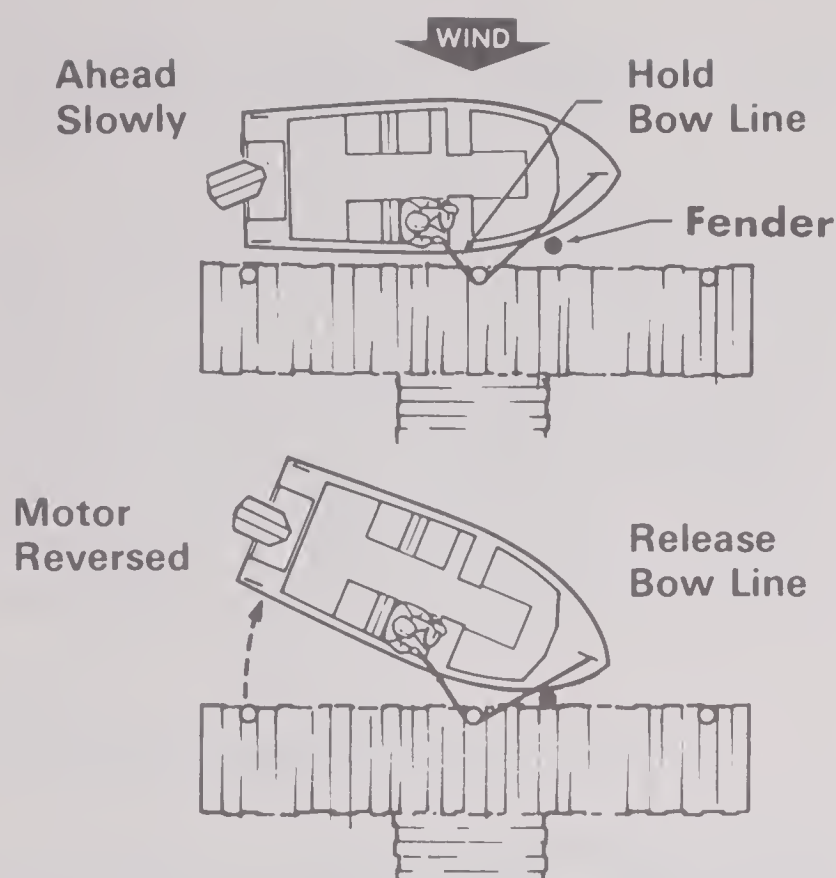


4-6 Leaving Dock - Wind on Bow

turn the wheel toward the dock and go ahead slowly. The boat will lever her stern out, and when it's as clear as it can get, you quickly cast loose your dockline and back away cautiously.

Use of Lines

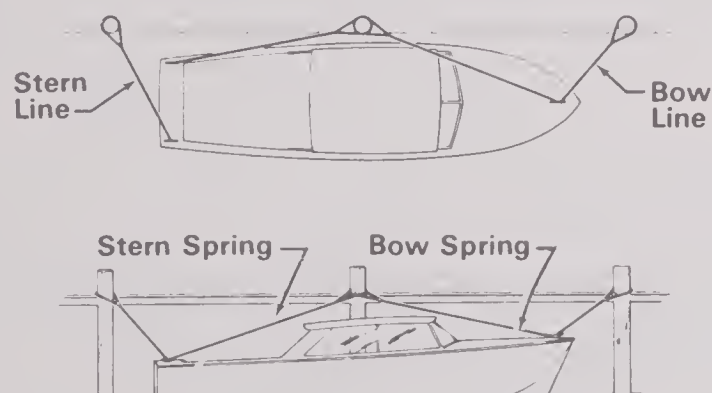
Mooring lines are used to keep a boat tied to a pier. The ones most often used are the bow line and the stern line. These are simple to set up and are usually sufficient for a short period provided fenders are used at strategic points to keep the hull from chafing.



4-7 Leaving Dock - Wind on Dock

If the boat is to be left for a substantial period of time, the use of breast or spring lines should be considered. Breast lines prevent sideways movement and spring lines limit the fore-and-aft movement of the vessel. If moored to a pier or wharf in tidal areas it is important to leave sufficient slack in all lines to accommodate the rise and fall of the tide.

USE OF BOW, STERN, & SPRING LINES



4-8 Mooring Lines

Heavy-Weather Seamanship

Sooner or later — but hopefully later — you will find yourself in seas and winds more rugged than you care for. Most modern boats are able to

absorb more than their crews can take, so let the boat do as much of the work as you can. If waves grow to the point where they feel dangerous, the best tactic is to head into them at a slight angle, corkscrewing your boat over the crests in much the same way a high jumper goes over the bar. This will retain maximum control of the boat, prevent pounding, and present the boat's strongest end to the waves.



4-9 Heavy Weather - Angle Into Waves

When the seas are coming at right angles to the boat, she may roll uncomfortably and even dangerously. All waves are not the same size, however, and large waves and small ones tend to group themselves together. You may be able to run broadside to during the small waves, then turn bow or stern to the seas when the larger waves arrive.

A fast boat in following seas will usually not have too much of a problem staying under control: Ride the backs of the waves, synchronizing your boat's speed to stay in the same place on the wave.



4-10 Heavy Weather - Ride Back of Wave

If you get over the crest, however, and start running down the face of the wave, your boat may swing wildly from side to side out of control, and even roll over. For this reason, it's a good idea not to run downwind in breaking seas unless you have no other choice.

If it appears that you won't be able to get back to home port before bad weather strikes, you should take steps to arrange yourself and the boat as best you can. Stow all gear firmly away — when a small boat rolls or pitches, equipment can fly all over the place. Make sure your pump is at hand and distress signals available, but in a dry place.

The crew should all put on Personal Flotation Devices. Besides their buoyancy, wearable PFD's will help keep you warm and will at least partly cushion you from bruises if you're bounced around in the boat. The crew should distribute themselves so that the boat rides evenly, and should get their collective weight as low in the boat as possible. Stay away from any breakable glass windshields or from places where you may be thrown against the engine.

Chances are that you will have no serious difficulty as long as you and your crew keep calm and as long as your boat's engine continues to function. If the engine should stop, the best tactic is to anchor. Even if the water is too deep for the anchor to hold, the weight of it and the anchor line will hold your boat's bow into wind and sea — the safest position in rough water.

Distress Signals

Should you require assistance, you should know the standard day and night methods for attracting help. In the daytime, standing in an open part of your boat (if you can do it with safety) and repeatedly raising and lowering your arms is the simplest distress signal. A horn or whistle, blown in repeated groups of five blasts (the danger signal) will also bring help, as will any loud noise, repeated regularly.

A yacht ensign or U.S. flag flown upside-down is still recognized as a distress signal, but more visible



4-11 Distress Signal - Arm Motion



4-12 Distress Signal — Inverted U.S. Flag

are the International Orange distress flags included in most commercial distress flare kits.

Flares themselves — red for night and orange smoke for day — are probably the most effective short-range signals. Be sure you have enough, and don't use them until you see another boat or aircraft that might be able to help you.

But if you proceed with caution in a good boat, you may be the one who is called upon to help. Be alert for another's distress, and assist if you can. If there is danger of imperiling your own boat and crew, then it is best to summon more professional assistance — the Coast Guard, Coast Guard Auxiliary, or Marine Police.



4-13 Distress Flares

Engine Trouble-Shooting

A great number of distress cases afloat are caused by engine failure. Difficulties with your engine — inboard or outboard — can be greatly reduced by proper maintenance according to the manufacturer's instructions. If you don't have a manual for your motor, obtain one from the dealer or manufacturer immediately. Make sure you have the recommended tools and spare parts aboard (and that you replenish spare parts, such as spark plugs, as they are used).

If your engine does give you trouble, however, and if you don't have information available for your precise make and model of motor, the following trouble-shooting tips may help:

Outboard engine

... Will not start; check for

1. Throttle in start position and shift lever, if any, in neutral.

2. Fuel in tank.
3. Fuel line properly attached to both tank and motor, with primer bulb nearest tank.
4. Carburetor primed by squeezing bulb.
5. Fuel tank edge clear of fuel line; line not kinked.
6. Engine choked, if cold.
7. Engine not flooded — if so, push in choke knob, disconnect fuel line from motor and crank until clear.
8. Dirty fuel pump filter.
9. Water in fuel.
10. Loose spark plug leads.
11. Plugs dirty, burned, or wet.
12. Plugs have improper gap.
13. Plugs are loose, causing poor compression.

... Idles improperly; check for

1. Carburetor adjustment poorly set.
2. Dirty, wet, or burned spark plugs.
3. Improper fuel mixture.

... Loses power; check for

1. Dirty, wet, or burned spark plugs.
2. Dirt in fuel or fuel pump filter partly blocked.
3. Obstruction at water intake: cooling system not operating.

... Vibrates excessively; check for

1. Bent or damaged propeller.
2. Carburetor poorly adjusted.

3. Steering friction control loose.
4. Weeds or other material on propeller.

... Runs but makes no progress; check for

1. Damaged propeller.
2. Weeds or other material on propeller.
3. Sheared pin, if motor is so equipped.

Inboard or inboard/outboard engine

... Will not turn over; check for

1. Discharged or low battery.
2. Loose or dirty cable connections at battery terminals.
3. Defective starter switch.

... Turns over but engine will not start; check for

1. Loose, dirty, corroded or damaged wiring in the ignition primary circuits — between junction box and ignition switch, wire to the coil and to the distributor.
2. Broken, damaged or wet wiring in secondary circuit (large wires to spark plugs).
3. Trouble in distributor: are points opening and closing as engine is cranked? Is opening proper width (about .020 inches)? Is contact button in distributor cap free to move?
4. Bad spark: hold insulated spark plug wire about 1/4" from engine and turn motor over with ignition on.
5. Overheated engine; may not restart until cool.

... Turns over with good spark but engine does not start; check for

1. Fuel in tank.

2. Is fuel reaching fuel pump? Check filter or sediment bowl; line may be clogged or shut-off may be closed.

3. Is fuel reaching carburetor? Shut off ignition, disconnect fuel line at carburetor and turn over engine to see if fuel is flowing this far.

4. Is fuel reaching spark plugs? Check by removing plugs to see if they are wet, then check carburetor adjustment.

5. Is choke operating properly?

6. Is engine flooded? Open throttle and put choke in non-choking position, then crank engine with ignition on.

Your Basic Tool Set

As you own boats for longer periods of time, you will accumulate a reliable tool set. To start with, here are some basic items:

Adjustable end wrench (Crescent)

Slip joint pliers

Pipe wrench

Vise grip pliers

Screw drivers (several sizes)

Box end wrench set

Hammer

Gauge for spark plug and distributor point gapping

Spare parts: spark plugs, fuel plump, shear pins, cotter pins, plus any additional parts recommended by your engine's manufacturer.



4-14 Basic Tool Kit



4-15 Desirable Spare Parts for Inboard

Chapter 4

TEST YOURSELF

Choose the correct answer for each question.

1. In order to build up skillful boat handling ability it is important to
 1. Have a planing hull
 2. Gain experience
 3. Develop the ability to plan ahead
 4. 2. and 3. above
2. In most cases, a heavily-loaded boat will be
 1. Significantly slower than when empty
 2. Higher in the water
 3. More able to rise over waves
 4. More nimble
3. Steering in close quarters, the skipper should
 1. Realize that the stern swings in a tighter circle than the bow
 2. Allow for the stern to swing wider than the bow
 3. Be aware that the stern tracks the bow, like a car
 4. 1. and 3. above
4. Given a choice, the best way to approach a pier or dock is
 1. Into the wind, and away from the current
 2. Into wind and current
 3. Away from wind and current
 4. Into current, but away from wind
5. When leaving a dock
 1. Handle the boat exactly like a car
 2. Always back clear
 3. Turn the wheel toward the dock and put the boat in reverse
 4. Push the bow clear, then ease ahead
6. If your boat is in waves of dangerous size, the best tactic is to
 1. Head directly into them at full speed
 2. Run directly away from them
 3. Head into them at a slight angle
 4. Any of the above
7. Besides providing buoyancy, Personal Flotation Devices will
 1. Help distribute crew weight
 2. Partly cushion the wearer from bruises
 3. Make it easier to move around in the boat
 4. All of the above
8. If your boat's engine should stop suddenly, you should
 1. Immediately make a distress signal
 2. Anchor the boat
 3. Have the crew sit in the stern
 4. None of the above
9. Recognized distress signals include
 1. Red flares by night
 2. Orange smoke by day
 3. Repeated groups of five blasts on horn or whistle
 4. All of the above
10. Basic engine tools include
 1. Adjustable wrench, vise grip pliers, screw-driver set
 2. Ball-peen hammer, turnbuckle, pole socket distributor
 3. Distress signal kit, fire extinguisher, small sledge
 4. Properly-sized oarlocks, boat hook, oar or paddle

Chapter 5

Rules of the Road

Introduction

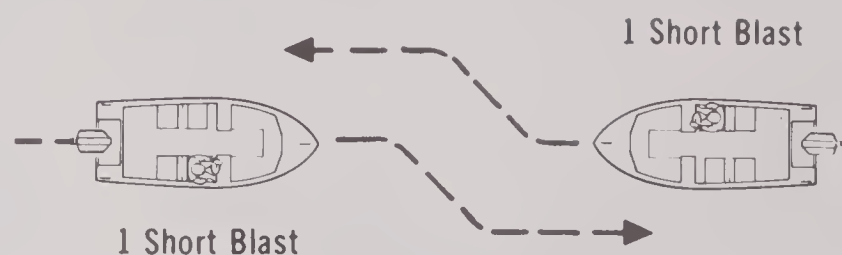
Traffic on roads and highways would be chaos without laws to regulate the right of way. On the water, where movement is less restricted, rules of the road are even more important. The nautical rules of the road have but one purpose: to prevent collisions. And while the rules of the road vary somewhat according to the locality in which your boat operates, most of the important rules and signals are the same.

The Three Situations

There are three situations which may lead to boats colliding: meeting head on; crossing each other's paths; and when one vessel is overtaking and passing another.

Meeting: Neither boat has the right of way, and each should swing right, then straighten course to pass left side to left side, as cars on the road do. If all boats stayed on their right-hand side of the channels, as they should, meeting situations would almost never involve risk of collision. But they don't, and if your boat and the other craft are on the left sides respectively of the channel, it is better to pass right side to right side than to try to exchange positions.

If you must change your boat's heading to avoid collision, then give one blast on your horn to indicate you are changing course to your right, or two blasts if you are changing course to your left.

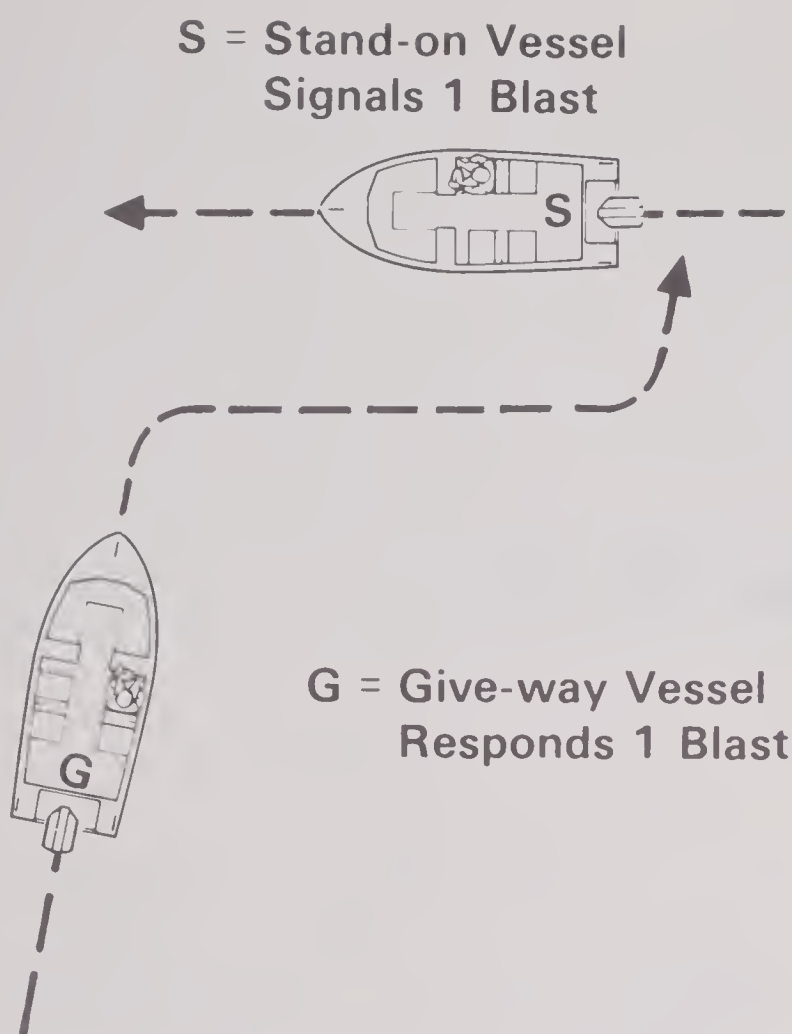


5-1 Meeting

Crossing: When two boats are approaching each other at right angles, it can be hard to tell if a crash is in the making. Sight along some vertical part of your boat — a flagstaff or antenna — at the other boat. If his angle of approach remains the same over a period of time, then you're in danger of collision.

When boats are in a crossing situation, the boat on the right has the right of way. This does not mean that skipper can do as he pleases. He is required to maintain his course and speed, so the other boat's operator can calculate the best method of keeping clear. The right-of-way boat should sound one blast of his horn to indicate that he is maintaining course and speed. The other boat answers with one blast, then turns, slows down, or takes whatever other action is necessary to avoid collision.

Overtaking: The boat being overtaken always has the right of way, and the overtaking boat should take the following steps if it wishes to pass:



5-2 Crossing

1. Swing clear of the wake of the overtaken boat, preferably so that the overtaker will pass as an overtaking car does, on the slower vessel's left side.

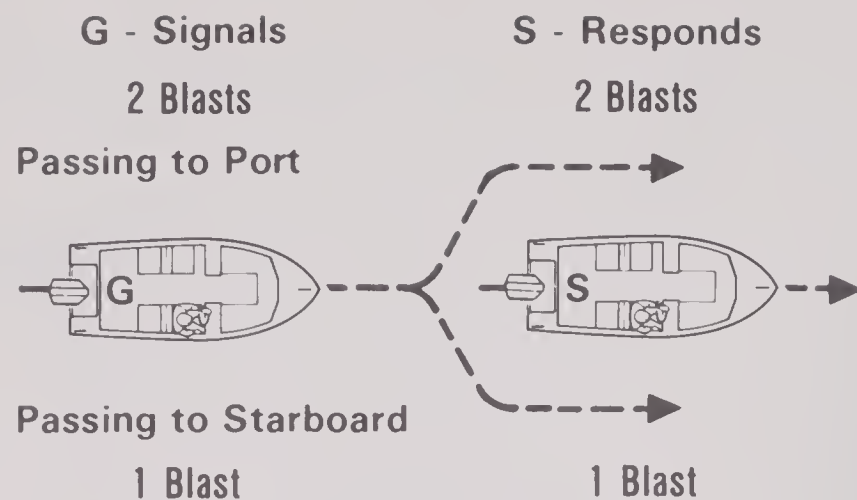
2. Sound two blasts of the whistle. Wait for an answering two-blast signal from the overtaken boat. (Note: If for some reason the boat being overtaken feels it would be dangerous to be passed, he should immediately sound the danger signal, five or more short blasts.)

3. Pass quickly. The passing boat must be clear ahead of the other vessel before the passing situation is ended.

If you wish to pass on the overtaken boat's right-hand side, then sound one blast and wait for a one-blast response before passing.

Sailboats and Special Situations

As a general rule, sailing craft have the right of way over engine-driven vessels, but it's important to remember the exceptions: a sailboat overtaking



5-3 Overtaking

a powerboat does not have the right of way (the overtaken vessel always has the right of way); a sailboat does not have right of way over a commercial fishing boat while it is fishing; no small vessel, power or sail, has the right of way over a large vessel in a narrow channel, when the large vessel cannot safely leave the channel.

In fact, with respect to large commercial craft — tugs, freighters, ferries, etc. — small pleasure boats will do best to stay completely clear of them. Large ships and tugs with tows cannot maneuver easily or stop quickly. Right of way aside, it is very foolish to approach large ships closely. This applies even when a large vessel is tied to a pier. Her propeller may be still turning over, and it can reduce a small boat to kindling in the wink of an eye.

When passing commercial docks and piers, be alert for one long blast of a ship's whistle, which means that a vessel is about to pull clear from a slip. Three blasts of a whistle mean that a ship's engines are in reverse and that she is beginning to back up.

Fog Signals

In fog, normal right of way rules apply, but with the addition of sound signals that tell other boats what you are up to before your boat is visible. Besides these extra signals, it is the duty of every skipper in fog to operate his boat so that she can be stopped in one-half the distance of visibility.

Fog signals differ in different areas. The following table summarizes them:

FOG SIGNALS

	<u>Inland (Coastal Waters)</u>	<u>International (Offshore)</u>	<u>Great Lakes</u>	<u>Western Rivers (Mississippi River and Tributaries)</u>
Powered Vessels:				
Single vessel	Prolonged* blast every minute	Prolonged blast every two minutes	Three "distinct" blasts each minute	Two short, one long blasts each minute
Vessel towing or pushing another	Prolonged followed by two short ⁺ blasts every minute	Prolonged followed by two short blasts every two minutes	Same as above	Three equal blasts per minute
Vessel being towed	Same as towing vessel	Prolonged followed by three short blasts every two minutes	Four strokes on bell each minute	None
Anchored vessel	Ring bell rapidly for five seconds every minute	Ring bell rapidly for five seconds every minute	Ring bell rapidly for three to five seconds every two minutes. Additionally, one short, two long, one short blasts on whistle every three minutes	Ring bell rapidly for five seconds every minute
Sailing Vessels	On starboard tack, one blast. Port tack, two blasts. Wind abaft beam, three blasts	Same as towing vessel, above	Same as Inland	Same as powered vessels, above

* "Prolonged" = four to six seconds' duration

+ "Short" = one seconds' duration












Lights

At night, of course, it's much harder for sailors to tell what ships are doing. The beginner is well advised to stay off the water at night until he's had a chance to accompany some experienced boatmen several times during the hours of darkness.

If you do find yourself out on the water at night, your boat must show the proper lights. Unlike

lights on a car, a boat's light system does not help the operator to see where he's going — in fact, he will see best if his own lights are out of his circle of vision. Rather, a boat's lights enable other vessels' skippers to tell where a given craft is, how big and what kind she is, and which way she is moving.

On inshore waters, most small boats carry a combination red-and-green light on the bow; it shows green to starboard(right), red to port(left),

	INLAND				INTERNATIONAL		
	SAIL ONLY		SAIL AND/OR POWER		SAIL ONLY		SAIL AND/OR POWER
	Under 26'	26' thru 65'	Under 26'	26' thru 65'	Optional if Under 12M	Under 20M	Under 20M
 Masthead or Bow 20 Pts = 225°				● Bow			● Masthead
 Combination Bow Red & Green	●		●			 OR	 OR
 Side Lights Red & Green 10 Pts = 112.5° Ea Side		●		●		 OR	 OR
 Masthead Red, Green, & White					●		
 Masthead Red Over Green						Plus ● Optional	
 Masthead or Stern 32 Pts = 360°			●	●			
12 Pts = 135°  Aft	●	●				●	●

7M = 7 Meters = 23 Ft 12M = 12 Meters = 39.4 Ft 20M = 20 Meters = 66 Ft

► Anchor Light: Single-fixture 360° White Light, Displayed by All Vessels at Anchor at Night

UNDER INTERNATIONAL RULES:

- (1). A power-driven vessel of less than 7 meters with maximum speed less than 7 knots may, in lieu of the lights specified, exhibit an all-round white light. Such vessel shall, if practicable, also exhibit sidelights.
- (2). A sailing vessel of less than 7 meters shall exhibit the specified lights if practicable. If she does not, she shall have ready at hand an electric torch or lighted lantern showing a white light which shall be exhibited in time to prevent a collision.

5-4 Light Requirements

and both colors from dead ahead. It can be seen from slightly aft of amidships, but not by someone overtaking. The same boat will also carry a white light aft, high enough to be seen all around the horizon. A sailboat carries the same bow light as a powerboat, but a smaller white light, which can be seen only from astern of it by another craft overtaking.

Vessels 26 feet and over carry separate red and green lights — red to port, green to starboard, plus the all-around white light and a second white light forward that covers the same arc as the combination of red and green.

Rowboats under way and boats at anchor show a single white light to indicate their position.

There are many different patterns of lights carried by various kinds of watercraft. Generally speaking, if you see a white light only, you are overtaking; if

you see a red light or a red and a white, you are looking at another boat's left side, and if you are crossing his path, he has the right of way. If you see a green light or a green and a white, you are looking at a boat's right side; if the two boats are converging, you have the right of way. And if you see both red and green, with or without a white light, another vessel is heading right at you.

If in doubt, stop your boat — day or night — and sound the danger signal. It's better to waste a couple of minutes sorting matters out than to have a crash or even a near miss. Stay clear of large clusters of lights on the water — these frequently indicate work, such as dredging, which can involve equipment dangerous to small craft.

As in fog, keep your boat's speed down to slow cruising at night, and make sure that everyone in the crew is alert.

Chapter 5

TEST YOURSELF

Choose the correct answer for each question.

1. The purpose of the rules of the road is to
 1. Make sure one boat is in the right
 2. Prevent collisions
 3. Allow high speeds on the water
 4. Prevent overtaking
2. When two boats are meeting head-on or nearly so
 1. Both have the right of way
 2. The right-hand boat has the right of way
 3. Neither has the right of way
 4. The situation is known as crossing
3. In a crossing situation, involving two powerboats
 1. The boat on the right has the right of way
 2. The boat on the left has the right of way
 3. Neither has the right of way
 4. The boat with right of way should keep clear
4. A boat being overtaken by another
 1. Never has the right of way
 2. Always has the right of way
 3. Has the right of way only if the overtaking boat is a sailboat
 4. All of the above
5. When overtaking another powerboat, you should
 1. Swing clear of its wake
 2. Sound appropriate whistle signal and wait for the same signal in response
 3. Pass quickly
 4. All of the above
6. With respect to powerboats, sailboats
 1. Always have the right of way
 2. Generally have the right of way, with some exceptions
 3. Never have the right of way
 4. Are invariably faster
7. When in the presence of large, commercial craft, small powerboats
 1. Should maneuver close behind them, to stay near the propeller
 2. Should stay completely clear of them
 3. Should insist on the small boat's right of way
 4. 1. and 3. above
8. When anchored in a fog, you should
 1. Sound a single blast on your horn every five minutes
 2. Make no sound at all
 3. Ring a bell to indicate your boat is not under way
 4. All of the above
9. When overtaking another boat at night, you should see its
 1. Red-and-green lights
 2. White stern light
 3. No light
 4. Occulting light
10. At night, if you see a green and white light, moving together in the same direction, you are probably looking at another boat's
 1. Stern
 2. Left side
 3. Right side
 4. None of the above

Chapter 6

Legal Requirements

Introduction

The responsibilities under law of the average boatman are not very complicated. He must usually register his boat with the proper authorities, keep them notified of sale, transfer or change of address, and equip the craft with certain basic items of equipment. This last requirement is the most difficult to observe, because required equipment varies with size of boat and with changing regulations, but it should present no great problem to the reasonably aware boatman.

Equipment Requirements

In specifying what equipment a boat must carry, the Coast Guard, under the Motorboat Act, works within four boat-length categories: boats up to 16 feet in length, boats from 16 feet up to 26 feet, 26 feet up to 40 feet, and boats from 40 feet through 65 feet. Let's examine the various items of gear required in each length group.

The new International Rules of the Road specify lengths in metric units. Lengths used there and of interest to us are 7 meters (23.0 feet), 12 meters (39.4 feet), 20 meters (65.6 feet) and 50 meters (164.0 feet).

Personal flotation devices: These also come in categories, and within each category there are different styles. Remember when buying PFDs that they must have a Coast Guard approval stamp.

Boats under 16 feet — one wearable or one throwable PFD for each person aboard or being towed by the boat.

Boats 16 feet through 65 feet — one wearable PFD for each person aboard **plus** one throwable device ready to be tossed to a man overboard.

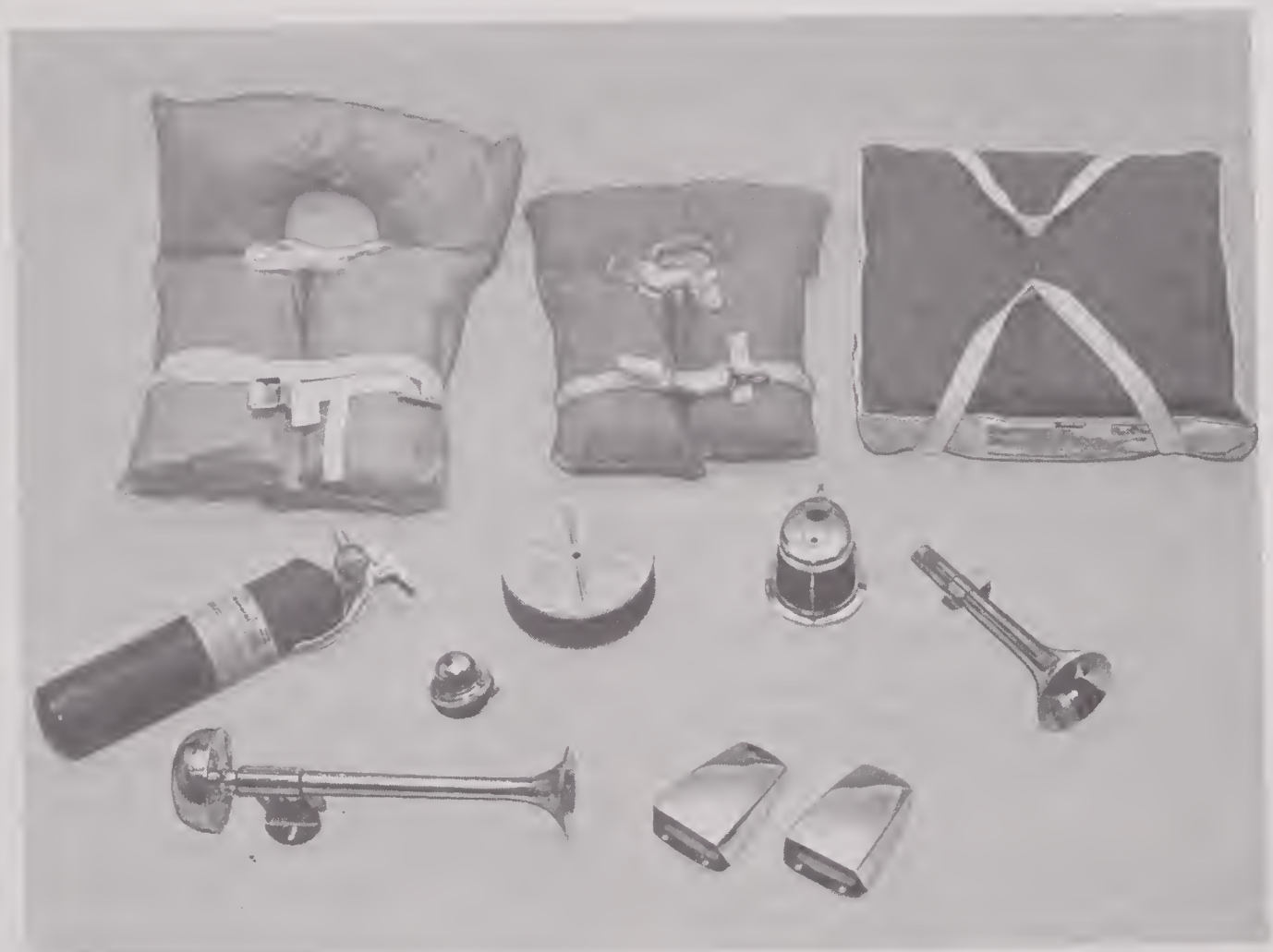
All PFDs must be in good condition and accessible quickly in case of need.

Fire extinguishers: These devices are classified according to the kind of fire they put out and the amount of contents. For small powerboats, extinguishers classified B-I or B-II are most common. Vessels less than 26 feet in length are required to carry at least one B-I extinguisher if the boat has any enclosed compartment which might trap gasoline fumes or other highly combustible materials. Even if your boat has no such compartments, it is at best foolish not to carry a fire extinguisher.

Whistle or horn: Boats 16 to 26 feet long (but not boats under 16 feet) are required to carry a whistle or horn, which may be mouth-operated, hand-operated, or power-operated. Although boats less than 16 feet don't specifically have to carry a whistle, they are required to make the necessary right-of-way and fog signals, for which a whistle is indispensable.



6-1 Equipment for Boats Less Than 16 Feet in Length

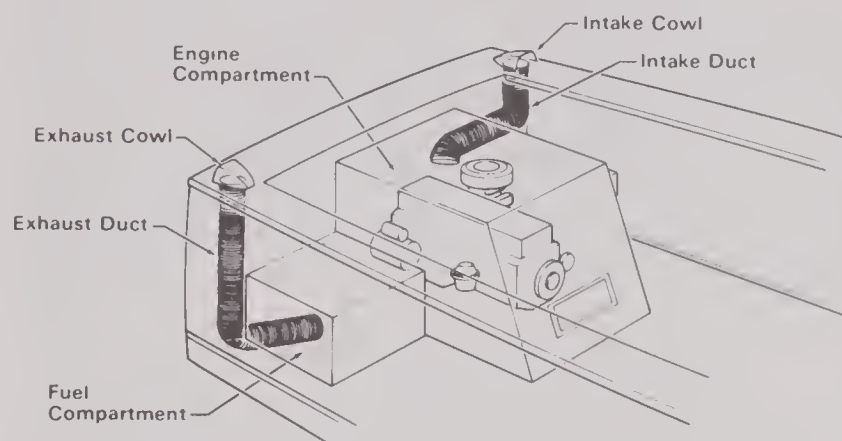


6-2 Equipment for Boats 16 Feet to Less Than 26 Feet in Length

Backfire flame arrester: This device cools down backfires from the carburetor and is required on gasoline-powered inboard and outdrive engines, but not on outboards.

Ventilation: Each engine and/or fuel compartment must be ventilated to prevent the collection of explosive gasoline fumes. A minimum of one intake vent, with tubing extended midway down into the vented compartment, and one exhaust vent, with tubing extended to near the bottom of the compartment, is required for each separate fuel and/or engine compartment.

VENTILATION . . . Combined Compartments



6-3 Ventilation

Lights: Boats operating at night are required to display the lights listed in Chapter Five.

Additional equipment: The equipment listed is, as noted earlier, minimal. Depending on where and how you use your boat, you should at least consider the following additional gear:

Distress flares, for day and night;

Anchor and anchor line, suitable for the waters cruised;

Paddles or oars, where the size and arrangement of the boat make them usable;

Bilge pump;

First Aid kit;

Tools and spare parts;

Charts and compass.

Courtesy Marine Examination

Probably the best way of making sure that your boat is equipped properly and is in seaworthy condition is to arrange for a free Courtesy Marine Examination. Performed without charge by specially-trained members of the U.S. Coast Guard Auxiliary, this examination ensures that you have aboard, in working condition, all the Federally-required equipment and your state-required safety equipment. In addition, other gear and safety installations required by common sense and experience are also checked by your Auxiliary Examiner.



6-4 Courtesy Marine Examination

If your boat passes the Examination, you are awarded the annual CME decal. Displayed on your windshield, this decal certifies that your craft is equipped and rigged above Federal requirements. Unless you are visibly violating a law, your boat will not normally be stopped by Coast Guard boarding teams or by state or local marine police checking equipment.

If your boat doesn't at first pass the Examination, no report of failure will be made to any law enforcement body. You will be told privately just why you didn't pass, and after rectifying the problem you will be issued a decal. Ask any Auxiliarist for more information about the CME program.



6-5 CME Decal

Other Required Items

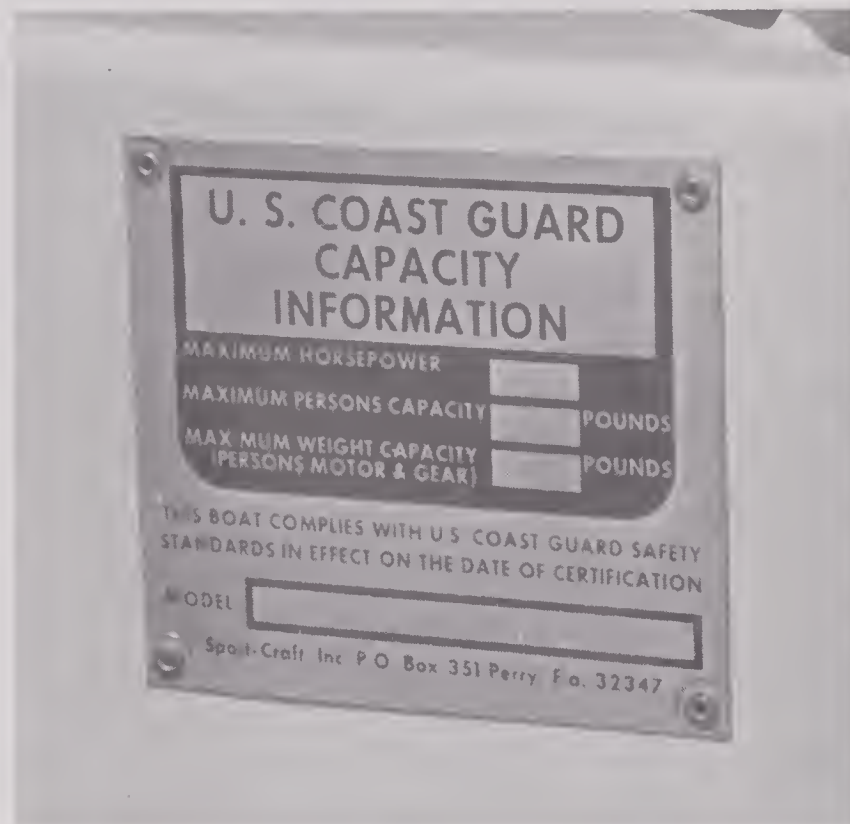
Hull Identification Number: Boats built after October 31, 1972 must display on the outside of the transom a multiple-digit number supplied by the manufacturer. This number, at least 12 digits and/or letters, indicates the boat's builder and date of construction. Numbers must be at least 1/4" high and affixed in such a way that removal would be obvious.



6-6 Hull Identification Number

Capacity information: Boats less than 20 feet long, construction of which began after October 31, 1972, must have a capacity plate visible to the boat's operator when he is getting the boat under way. The plates on outboard boats must show maximum horsepower, passenger capacity (pounds) and total load capacity (crew, engine, gear). Inboard, out-drive, and engineless boats must show passenger capacity and total load capacity, both in pounds.

Exceptions: The following boats do not have to carry capacity information – multihulls, sailboats, canoes, kayaks, inflatable boats.



6-7 Capacity Plate and Certification of Compliance

Manufacturer Certification of Compliance: Monohull boats less than 20 feet in length (except sailboats, canoes, kayaks and inflatables), construction of which began after October 31, 1972, must carry a label which reads as follows: "This Boat Complies with U.S. Coast Guard Safety Standards in Effect on Date of Certification." (Or an actual date.) This label is often combined with the capacity plate.

Numbering: Federal law now requires that all undocumented boats propelled by machinery must be registered. Most states have registration requirements of their own beyond this bare minimum, so check with your state boating authority. Your boat will be issued numbers similar to the license numbers of your car – but you'll have to provide your own license plate. The proper way to mount numbers (available at any marine store in the proper 3-inch size) is illustrated here. The spacing of the numbers is quite important, as is the requirement for a contrasting background – light numbers on a dark hull, or vice versa. Your state may also issue an annual sticker to be applied alongside the registration numbers.

Numbers are mounted on each side of the forward half of the vessel. Normally they are placed near the bow although when the hull is flared forward, numbers may be affixed to the hull anywhere forward of amidships or on the permanent superstructure forward.

When the boat is sold or transferred, the number normally stays with it (unless the new owner lives in another state). You must advise your state boating commission or equivalent agency of any such sale or transfer within the specified time listed on your boat registration.



6-8 Registration Numbers

Accident Reports

The operator of any boat involved in an accident must stop, render assistance and offer identification. In accidents involving death or disappearance, the nearest reporting authority must be notified immediately. A written boating accident report is required within 24 hours if as a result of the accident a person dies, disappears from a vessel, or is injured and requires treatment beyond first aid. In addition, a written boating accident report must be submitted within 10 days if a vessel is lost or damage to the vessel or other property exceeds \$200.

Boating accident report forms can be obtained from, and should be submitted to, the state boating authorities having jurisdiction on the waters on which the accident occurred. In jurisdictions which do not have an approved numbering system (Alaska, American Samoa, New Hampshire and Washington) the accident report form (CG-3865) can be obtained from the nearest Coast Guard Office or unit and should be submitted to the nearest Coast Guard Marine Inspection Office. The contents of accident reports are not made public.

The best way you can avoid accident or injury on the water is to equip your vessel properly, use it with care, and continue your own boating education. The Coast Guard Auxiliary has several other courses open to the public, covering many other aspects of boating. You may also wish to consider membership in the Auxiliary. More information in either case is available from any Auxiliary member.

Chapter 6

TEST YOURSELF

Choose the correct answer for each question.

1. A boatman's basic legal responsibilities include
 1. Registering his boat with proper authorities
 2. Advising these authorities of sale, transfer or change of address
 3. Equipping the boat with certain legally-required gear
 4. All of the above
2. Boats 16 feet long and longer must carry
 1. One wearable or throwable PFD
 2. One wearable PFD for each person aboard, plus one throwable PFD
 3. No throwable PFDs
 4. All throwable PFDs
3. The backfire flame arrester is only required on
 1. Gasoline-powered outboard engines
 2. Gasoline-powered inboard or outdrive engines
 3. Boats from 26 to 65 feet in length, irrespective of power
 4. On all gasoline engines, inboard, outboard and outdrive
4. Beyond the legal requirements, you should also consider carrying
 1. Distress flares
 2. Bilge pump
 3. First Aid kit
 4. All of the above
5. The Coast Guard Auxiliary Courtesy Marine Examination
 1. Is a check of legally-required gear and other safety equipment
 2. Is performed at no charge
 3. Is mandatory
 4. 1. and 2. above
6. The Hull Identification Number
 1. Is molded into the bow
 2. Indicates the boat's builder and date of construction
 3. Always shows the boat's length
 4. All of the above
7. Which of the following does not appear on a capacity plate of an outboard
 1. Boat length
 2. Maximum engine horsepower
 3. Passenger capacity in pounds
 4. Total load capacity (engine, crew, equipment)
8. Federal law requires that all undocumented boats propelled by machinery
 1. Carry a capacity plate
 2. Be registered
 3. Be named
 4. All of the above
9. When a boat is sold or transferred within a state, its number normally
 1. Stays with the original owner, for his next boat
 2. Is retired from circulation
 3. Stays with the boat, if the new owner lives in the same state
 4. None of the above
10. In case of a boating accident, you must file a report in case of
 1. Death or disappearance
 2. Personal injury requiring treatment beyond first aid
 3. Property damage in amount over \$200.00
 4. Any of the above

TEST YOURSELF ANSWERS ON NEXT PAGE

ANSWERS TO SELF-TEST QUESTIONS

Question No.	Correct Answers for Chapter Number					
	One	Two	Three	Four	Five	Six
1	3	3	4	4	2	4
2	1	1	1	1	3	2
3	2	2	3	2	1	2
4	3	4	4	2	2	4
5	4	4	2	4	4	4
6	4	2	2	3	2	2
7	1	4	3	2	2	1
8	3	1	1	2	3	2
9	2	3	4	4	2	3
10	4	3	4	1	3	4

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